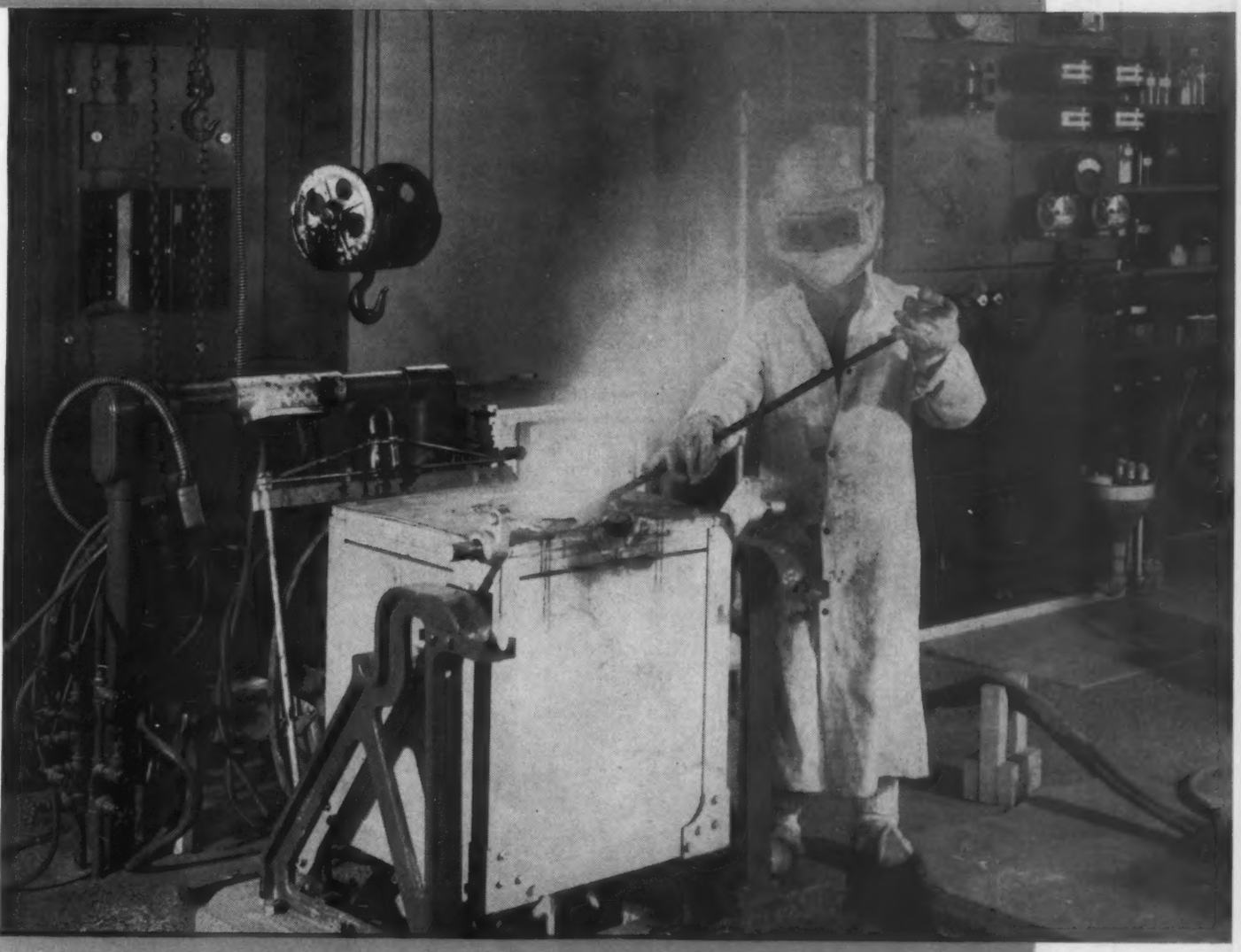
OCT 6 1942

American Foundryman

A PUBLICATION PRESENTING ASSOCIATION AND CHAPTER ACTIVITIES



Safe Practice at the Induction Furnace (See page 6) *(Courtesy Ajax Electric Furnace Corp.)*

Time and Motion Study for Foremen, See Page 2. Chapters Set Up War Problems Committees, See Page 6. ArmaSteel in Industry (2), See Page 9. A.F.A. Committee Personnel 1942-43, See Page 17. Magnetic Powder Testing Report, See Page 25.

October 1942

A.F.A. Membership: Step Toward Victory

"AS A member of the American Foundrymen's Association I am helping the Foundry Industry do its utmost toward Winning the War!"

Perhaps A.F.A. members have never thought of their memberships in those words, but that is actually what membership means. His plant may be engaged one hundred per cent in war production, and he and his employees may be represented one hundred per cent in buying war bonds. A.F.A. membership means that he is doing that **something extra** that all of us must contribute toward the war effort so as to get this tremendous job done . . . and done as quickly as possible.

Membership makes it possible for A.F.A. to carry on its extensive and valuable committee work, seeking out constantly the best information available on improving foundry practices, processes and products, and distributing that data throughout the industry. In this issue of "American Foundryman" over 100 different committee activities are listed, on which over 400 foundrymen are serving, without remuneration, to assist the rest of the industry in its problems.

Membership keeps a foundryman up-to-date with what is going on in his industry, brings him priceless contacts with other foundrymen, and establishes a pride of craft without which no industry ever became great. Each class of A.F.A. membership has a separate purpose, a separate and distinct value in the national organization.

Sustaining Members play an important part in promoting and broadening apprenticeship throughout the industry, one of the greatest of foundry problems today. Plants holding Company Memberships make it possible for individuals to hold Affiliate Memberships at greatly reduced cost, thereby benefiting the companies themselves through greater knowledge on the part of their employees. Personal Members receive from their memberships authoritative data worth far, far more than the small amount of A.F.A. dues.

The days of self-sufficient foundry plants are gone. War has made more necessary than ever before closer cooperation and more frequent contact between individual foundry units. A.F.A. membership strengthens the entire industry through faster distribution of essential technical and production information.

Every A.F.A. member can truly say that he is helping his industry do its **utmost** toward Winning the War when he takes an active part in the affairs of his Association and passes on to his associates the advantages of membership.

B. D. Claffey

B. D. CLAFFEY, Director, American Foundrymen's Association

B. D. CLAFFEY, Manager of the Gray Iron and Aluminum division of General Malleable Corporation, Waukesha, Wis., in addition to being a Director of A.F.A. is Chairman of the A.F.A. National Membership Committee, and a member of the Executive Committee of the Board of Directors. He also has been very active in affairs of the Wisconsin Chapter, serving as Chairman during the past year. Mr. Claffey entered the foundry industry in 1915 as a laborer with the Spring City Foundry, Waukesha. In 1928 he became foundry advisor to Wisconsin Motor Co., Milwaukee; in 1930, works manager, Milwaukee Gray Iron Foundry Co., and in 1933 organized the Claffey Casting Co. of which he was president and general manager, which was merged with General Malleable Corp. in 1936.

A. F. A. Officers

President
D. P. FORBES*
Gunite Foundries Corp.,
Rockford, Ill.

Vice President
L. C. WILSON*
Reading Steel Casting Div.,
American Chain & Cable Co., Inc.,
Reading, Pa.

Board of Directors

Term Expires 1943

G. W. CANNON
Campbell Wyant & Cannon Foundry Co.,
Muskegon, Mich.

B. D. CLAFFEY*
General Malleable Corp., Waukesha, Wis.

HAROLD J. ROAST
Canadian Bronze Co., Ltd., Montreal, P. Q.

L. P. ROBINSON
Werner G. Smith Co., Cleveland, Ohio

H. S. WASHBURN*
Plainville Casting Co., Plainville, Conn.

Term Expires 1944

R. J. ALLEN
Worthington Pump & Machinery Corp.,
Harrison, N. J.

J. G. COFFMAN
Los Angeles Steel Casting Co.,
Los Angeles, Calif.

M. J. GREGORY
Caterpillar Tractor Co., Peoria, Ill.

VAUGHAN REID
City Pattern Works,
Detroit, Mich.

L. N. SHANNON
Stockham Pipe Fittings Co.,
Birmingham, Ala.

Term Expires 1945

J. E. CROWN
U. S. Naval Gun Factory,
Washington, D. C.

H. S. SIMPSON*
National Engineering Co., Chicago, Ill.

I. R. WAGNER
Electric Steel Castings Co.,
Indianapolis, Ind.

S. V. WOOD*
Minneapolis Electric Steel Castings Co.,
Minneapolis, Minn.

W. L. WOODY
National Malleable & Steel Castings Co.,
Sharon, Pa.

Staff

Executive Vice President and Treasurer
C. E. WESTOVER†*
Convention and Exhibits Manager
C. E. HOYT†
Secretary
R. E. KENNEDY†
Assistant Secretary
N. F. HINDLE†
Assistant Treasurer
J. REININGA†

†Headquarters
Room 1398, 222 West Adams St., Chicago, Ill.

*Members, Executive Committee

American Foundryman

CONTENTS

October, 1942

Volume 4 **Number 10**

	Page
A.F.A. Membership: Step Toward Victory, *by B. D. Claffey*	Inside Front Cover
Time and Motion Study for Foremen, *by Phil Carroll, Jr.*	2
A.F.A. Chapters Set Up Groups To Help Foundries Solve War-time Problems	6
ArmaSteel — Cast for Leading Role in Industry (Part II), *by Carl F. Joseph*	9
New High Temperature Sand Group Personnel	13
A.F.A. Announces Essay Contest for Engineering School Students	14
Studying Uses of High Temperature Cast Iron	14
Chapters Aiding in Support of Cupola Research Project	15
New Chapter Officers	16
Over 400 Foundrymen Volunteer for A.F.A. Committees in Vital War Year—(Committee Personnel for 1942-43)	17
Steel Division Issues First Report on Magnetic Powder Testing	25
Foundry Finds Job Instructor Training Really Trains Men	30
New Members	31
Random Comments	32
Chapter Activities	33
Abstracts of Current Foundry Literature	39

Published by the American Foundrymen's Association, Inc., 222 West Adams St., Chicago, Ill., for the purpose of presenting Association and Chapter activities. Published monthly. Subscription price, to members, $1.00 per year; to non-members, $1.50 per year. Single copies, 20c.

Entered as second class matter July 22, 1938, at the post office at Chicago, Illinois, under the Act of March 3, 1879.

Time and Motion Study for Foremen

By PHIL CARROLL, JR.,* Maplewood, N. J.

The following article, written to and for shop foremen, stresses the importance of foremen having a knowledge of time and motion study in order to save precious time in production. There is nothing mysterious about time and motion studies; it is simply a matter of applying common sense in measuring effort. Four steps are outlined in making such studies: (1) Taking the job apart, (2) actually clocking each job element, (3) deciding on a fair standard time for each element, and (4) setting incentive standards for each job.

The Reason Why

As a foreman, you need to know "everything" about Time and Motion Study. The knowledge is important because:

1. Too many worker's grievances' start with complaints of earning possibilities.

2. "Time" is the largest, single element of your cost, assuming reasonable scrap.

3. You can do a lot to conserve time when you can "see" how much of it is actually wasted.

4. Important reductions in process time can be made when you understand the value of suggestions made by your men.

Full knowledge of Time and Motion Study is so necessary to the proper functioning of every foreman that he should be given active training in that work. Logically, the "future" foreman should be given a couple of years experience in "standard setting."

However, the pressure for time is so great that many men are unable to ge "first hand" training. And yet, it seems necessary to make available a brief explanation of the four essential steps taken to determine an operation "standard time."

Perhaps this article may eliminate any notion you may have had that Time and Motion Study is in any way something mysterious. It is nothing more than common sense applied toward the measurement of effort.

STEP ONE

Taking the Job Apart

WHEN we were kids, we took things apart to see what "made them go." Today, we do the same thing when we want to find out what takes place in a particular operation.

Time and motion study begins with the breakdown of an operation into its smallest details. This is the first step toward saving time and effort because it trains the observer to see exactly what work is done. The breakdown process in time and motion study is called "element analysis."

Most operations are made up of very small elements. These may be short enough to average twenty per minute. The elements are recorded in sequence to show how the operation was performed. (See Fig. 1.) Some elements are called Constants, others are Variables.

Breakdowns Necessary

Detailed element breakdowns are necessary because a time study must record everything that took place during the period of observation. Time studies must be completely detailed so that their common elements of work can be compared.

Constants. Elements that are practically the same regardless of the part worked on are called Constants. On a certain type of drill press, the element "Lower Spindle" would require the same standard time.

Variables. Other elements vary with size and shape, or the amount of work done. The "Drilling" time is a Variable because it changes with the size of drill, depth of hole, kind of finish and type of material.

Training in element analysis greatly improves the ability to observe correctly.

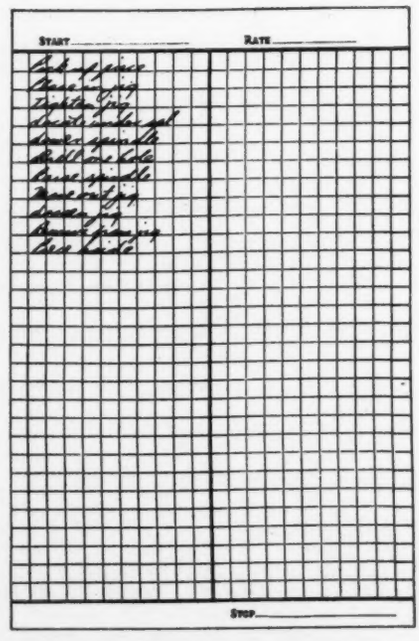


Fig. 1—How an operation is "broken down" into individual elements, recorded in sequence for purposes of making a time and motion study.

What to Look For

Detailing an operation in its elements is like looking at it through a microscope. You can see so much more of what goes on. You discover things about the operation you did not know existed.

Sometimes you will find that the operation can be eliminated. It may have been started when some bad lot of material was worked on. After that material was finished, someone forgot to stop the added operation.

A complete investigation may show that part of the work done in one operation is afterward "cut away." Here again, wasted effort can be stopped.

More intensive study of your operations will reveal that much of the time is spent for "Get Ready" and "Put Away." Perhaps only a third of the total time is used in working on the job itself. Count the elements shown in Fig. 1 that are done to accomplish the "Useful" one of drilling.

Reduce Motion

When an operation similar to that shown by Fig. 1 can be combined with another, it is often possible to eliminate much of the "handling" of the next operation.

If the drilling is done by power-feed, some of the elements may be completed during that interval of "waiting time." When two jigs are available, per-

* Management Consultant.

haps one can be loaded during the drilling time of the other.

The "Pick Up" and "Lay Aside" should be studied to determine if there is a more convenient location or disposal for the material.

The elements of "Loading" and "Unloading" the jig may be improved by the use of more convenient holding devices. Maybe you will discover that several sizes of wrenches are used because the nut sizes are not standardized.

Sometimes the "Locating" of the jig under the spindle can be improved by properly arranged stops, or perhaps eliminated, by clamping the jig in place.

Time and motion study training will enable you to see more clearly how the operators spend their time. Then you will be able to improve production because, without help from anybody, you can reduce the number of motions in the operations in your department.

STEP TWO

How Long Does It Take?

A stop-watch is used to find out how long it actually takes to do each element of the operation. As a matter of fact, "stop-watch" is an improper term, because a good time study man records everything—he does not "stop" his watch.

The watch is usually read at the end of each element, and the hand returned to zero. This "Snap-back" method supplies the element times without substracting.

On short operations, many pieces are studied. Only a few pieces are "timed" on long operations, and on set-ups or one-piece orders, one cycle is studied.

The watch readings are recorded on the time study beside the elements to which they apply. These figures are actual "times taken." This is important to remember because anyone will agree that the "time taken" is not necessarily a fair time.

Usually, the actual times are low because most operators work faster while being studied. Therefore, to set a fair standard, the performance observed must

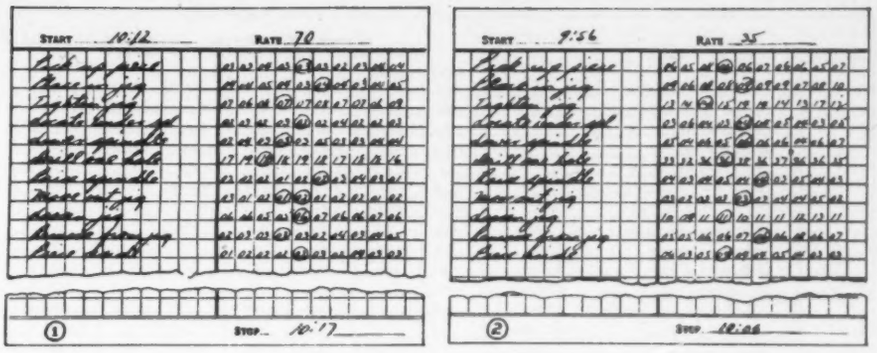


Fig. 2—Actual "times taken" by stop watch to do each element of a job, recorded for two operators working at different rates, one at the rate of 70 pieces an hour (a—left), the other at 35 pieces (b-right).

be "rated." Rating is an appraisal of the effort made by the operator during the study.

The examples given in Fig. 2 show actual "times taken" of an operation done by two operators working at different rates.

The rating must be made during the time study because the operator's effort changes frequently. Every day, it varies about 50 per cent from low to high. We all know too how effort changes during the week, especially from Monday on.

STEP THREE

How Long Should It Take?

There may be a great difference between how long it does take and how long it should take to do a certain operation. Nevertheless, the time study man has the responsibility for arriving at a "fair standard time." Therefore, the actual times must be adjusted to be representative of a "fair day's work."

For several reasons, the standard times are set for every element shown on the time study. They are obtained by converting actual times to standard times. The watch readings selected by circling in Fig. 2 are changed to Normal time by the rating factor.

Fig. 2-a shows the rating as 70 minutes per hour. The standard time is obtained by using the ratio of 70/60. This raises the low actual times for a good performance to those needed for the normal operator.

Fig. 2-b is a study taken of a new operator who is slow. The rating of 35 is used with 60 (35/60) to reduce the actual times to normal.

The difference in actual times shown on these examples should indicate how ridiculous it is for anyone to say that a standard is "too tight" just because the operator can't make it. It should be obvious that actual "stop watch" times taken by an untrained observer may only serve to aggravate an argument.

After the normal times is determined as indicated in Figs. 1 and 2, a correct amount of relaxation is added, as shown in Table 1.

The standards came out the same for these two elements despite the difference in actual time. These standards must be the same because the work done is identical in both cases. Consistency of incentive standards depends upon the allowance of comparable times for similar work.

STEP FOUR

How Are Time Study Standards Set?

If all incentive standards could be set from the same time study, consistency would be assured. But, that cannot be

Table I

Calculating Standards from Actual Time of Operations

Study	*Elements*	*Actual Seconds*		*Rating*		*Relax*	*Standard Seconds*
Fig. 2-a	Tighten jig	.07	×	70/60	+	20%	.10
Fig. 2-a	Loosen jig	.06	×	70/60	+	20%	.08
Fig. 2-b	Tighten jig	.14	×	35/60	+	20%	.10
Fig. 2-b	Loosen jig	.11	×	35/60	+	20%	.08

COMPARISON SHEET

STUDY NUMBER		385	392	405	406	415	417	418
PART NUMBER		13281	13312	13321	15506	16110	18167	15491
MATERIAL		CRS	CRS	CRS	CRS	CRS	CRS	CRS
OPERATOR		SMITH	BLOCK	JONES	CROSS	BARRY	BARRY	BROWN
STOCK LENGTH x DIAM		5 x 1	5 x 1	30 x 2	15 x 2	5 x 2	25 x 1	12 x 1
HOLE - DIAM x LENGTH		1 x 1/8	1 x 1/8	1 x 1	1 x 1/8	1/4 x 1/4	1/4 x 1	1/4 x 1/8
JIG NUMBER		3470	3470	3471	3471	3471	3470	3470
EFFORT RATING	STAND.	70	35	55	60	80	70	75
PICK UP PIECE	TABLE 1	.04	.04	.12	.10	.06	.12	.08
PLACE IN JIG	TABLE 1	.06	.06	.08	.08	.06	.07	.06
TIGHTEN JIG	TABLE 2	.10	.10	.13	.14	.11	.15	.12
LOCATE UNDER SPINDLE	TABLE 2	.03	.03	.06	.05	.04	.05	.04
LOWER SPINDLE	.04	.04	.04	.04	.03	.04	.03	.04
DRILL ONE HOLE	CURVE 1	.25	.25	.23	.12	.40	.15	.19
RAISE SPINDLE	.03	.03	.03	.02	.03	.04	.03	.04
MOVE OUT JIG	TABLE 2	.02	.02	.04	.02	.01	.03	.01
LOOSEN JIG	TABLE 2	.08	.08	.10	.08	.07	.12	.09
REMOVE FINISH JIG	TABLE 2	.04	.04	.06	.05	.04	.06	.04
PIECE ALIKE	TABLE 1	.03	.03	.10	.07	.05	.09	.06

Fig. 3—To establish proper incentive standards, time studies on a number of operators may be combined on a Comparison Sheet for convenient analysis. Times posted are "element standards," obtained by applying a rating factor to actual times shown in Fig 2, plus 20 per cent for relaxation.

done very often because there are so many differences in work size and amount.

Consequently, incentive standards are set by either of two basic methods. The element standards determined similarly as the examples indicate, may be added to get the total for the operation. This process of using the individual time study to set a standard creates certain inconsistencies in work-time allowance.

To gain the benefits of the imaginary time-study containing all work elements, many studies may be combined to form standard data. The several studies may be conveniently analyzed and compared by recording them on any big sheet of paper called a "Comparison Sheet," illustrated in Fig. 3.

It is started by listing all the elements down the left side. Each study is recorded in a column by itself as soon as it is finished.

Times posted on the Comparison Sheet are "Element Standards" only, obtained by applying the rating factor to selected time study "actuals" and then adding the proper amount for relaxation. (Step Three.)

Constant standards are selected from the Comparison Sheet the same as one element value is determined from many watch readings on a time study. Variable elements like those of "Drilling" are analyzed and compared, usually by means of plotted curves.

Consistency of standards is obtained when standard data are used because the same allowances are made whenever the work done is the same.

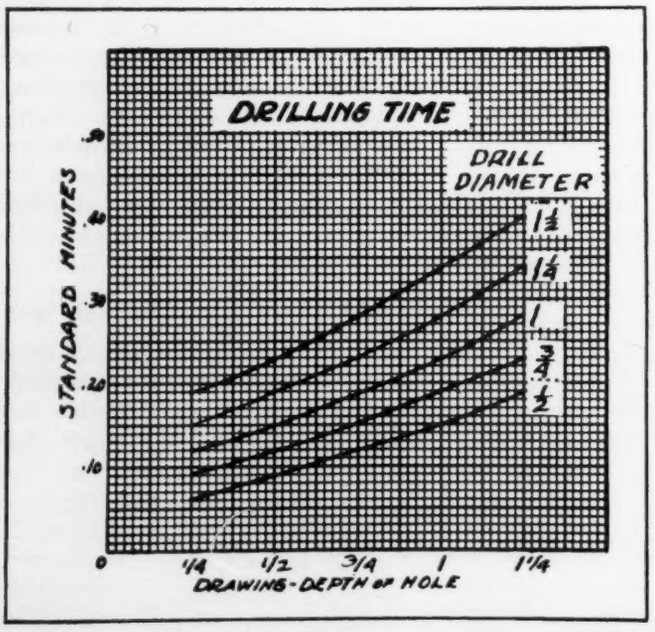
Standard data consist of lists of element standards, curves, tables and charts prepared from the Comparison Sheet for use in standard-setting. Some examples of standard data used are shown in Fig. 4.

Operation standards are set from data similar to that shown above by selecting those times which properly apply to the work to be done. An example is shown in Table 2.

Points to Remember

When you know how time standards are set and, more particularly, what work is not included, you can correctly instruct your men in ways to increase their earnings. When you can correctly explain how the premium is "figured," you can eliminate much of the haggling that often results from misunderstanding of the incentive plan.

Arguing can easily degenerate into "horse trading."



HANDLING STANDARDS

PIECE Handling Time		Length of Stock 5	10	15	20	25
Diameter of Stock	1	.17	.21	.24	.29	.35
	2	.21	.25	.30	.36	.43
	3	.25	.30	.36	.43	.52

JIG Handling Time		Length of Piece 5	10	15	20	25
Drill Jig Number	3470	.23	.25	.28	.31	.35
	3471	.24	.26	.30	.33	.36
	3472	.25	.28	.32	.36	.42

Lower Spindle	.04	
Raise Spindle	.03	TOTAL R & L .07

Fig. 4—To obtain consistency of standards, standard data are used at all times. (Left) Plotted curve used for comparing Variable elements, as "Drilling." (Right) Handling Standards obtained from Comparison Sheet in Fig. 3, selected in same way that element values are determined from stop watch readings.

Table 2

Setting Operation Standards

Elements	*Job Specifications*	*Standard Seconds*
Piece Handling	2 in. Diam. × 15 in. Long	.30
Jig Handling	No. 3471	.30
Drilling 1 hole	1 in. Diam. × ½ in. Deep	.12
Lower and Raise Spindle once		.07
	Total	.79

Bargaining is sure to produce inconsistent earnings.

Inconsistency between earnings and work done is a very real cause of worker dissatisfaction.

Training in time and motion study would be very worth while if you learned nothing more than how to explain to your men, in an understandable way, how their earnings are determined with your incentive plan.

Train Your Men

Everyone has some difficulty learning to do a new job effectively, or to do a changed job in the proper time. One of the chief reasons why operators "can't make standard" is because you, as the foreman, have not trained them in the methods to use. You should realize that operators cannot be expected to earn satisfactory premium unless they follow methods which determine the time standards.

The requirement that every foreman be a good teacher is one of the reasons why it has been said that "the foreman of an incentive department must be twice as good as when his men are on day work."

Supervision has to be paid for, one way or another. If you do not supply the necessary training and guidance, more highly skilled workers are needed, or the standards must be set to allow for more waste motion.

You should do the training yourself to gain consistency in the methods used in your department. Besides, your workers look to you to provide the means for promotion.

Remember! The No. 1 desire of the worker is "opportunity for advancement."

Delays Change Earnings

Delays are expensive, besides being very irritating to the operators. Delays interfere with the normal flow of work and cause the operator to change his routine.

Delays to the production of incentive workers usually cause proportionately lower premium earnings. Delays are often overlooked in piece-work and group bonus plans because the workers are paid only for the production turned in.

Delays are much more expensive than you realize. The labor cost of delay is small in comparison to the total cost of "waiting." The equipment and floor space together with maintenance, taxes and numerous insurances are several times as expensive as the direct wage.

Delays are caused by failures in planning. Regardless of any regularized planning department, you must do much "thinking ahead" on your own work if your men are going to make high incentive earnings. For example:

Are the jigs and fixtures ready when the jobs start?

Are the drawing and methods sheet available beforehand?

Is the operator instructed in the correct method?

Is the material in shape to begin the operation?

Effect of Working Conditions

Definitions of normal working conditions must be established so that incentive standards can have some reasonable degree of permanence. Kind of material, type of equipment, tooling, quality of finish—tolerance are examples of conditions that must be defined.

Good incentive measurement is not based on an average of conditions broad enough to cover the many changes that occur every day. Examples are harder castings, extra stock, closer tolerances and finer finishes.

Extra work caused by poor conditions increases the cost and lowers production. From the standpoint of good operations, the worker might just as well be standing idle part of the time as to work under the handicap of poor tooling, materials and equipment.

It is unfair to expect the worker to take "the bitter with the sweet." Therefore, extra time allowances must be made for unusual conditions. Primarily, the operators must be protected and, secondly, management should be shown how much faulty conditions actually cost.

Listen to Suggestions

The foreman may think that all suggestions for improvement come from time and motion study men. Many do, but there are good reasons why.

Time and motion study men "make a full-time job" of finding better methods of production. Operators and other foremen make many suggestions to time and motion study men because they want to avoid "showing up" the foreman directly concerned.

There are many more workers than foremen and time study men combined, all of whom can make suggestions. The operator will get much more enjoyment and pride from his work when he can see some of his own ideas "put to work."

Because the "suggestion system" has failed is no proof whatever that workers do not have many excellent suggestions. They may have found it more profitable to themselves to use their ideas in making more bonus.

You can correct faulty attitudes toward making suggestions by seeking the ideas your men have for bettering methods. Then you must see that full credit is given to those who advance good ideas. Pass on to others some of the credit you may be entitled to receive.

Something to Think About

Fair dealing and constructive leadership go far toward inspiring confidence. To succeed as a leader, you must be able to analyze the facts, determine the causes, prescribe the correct course of action, and then per-

suade your men to follow you to the complete solution of the problem.

To be "constructive," you must look upon your department as an outsider would. You must leave personal feelings out of discussions and decisions. Personal prejudices are sure to be resented.

When you are open-minded and progressive and can gain the loyalty and respect of your men, you will be given the opportunity to adjust complaints before higher management is approached.

Gain Broader Picture

Training in time and motion study will give you a very much clearer picture of the company's problems and policies. You will then be better fitted to act as the interpreter of management's viewpoint to the worker.

When you are trained in time study methods you will have a much better understanding of the work done by planning, accounting, engineering, inspection and sales departments. Training in time and motion study will enable you to more correctly analyze ideas, assemble facts, and present them to "your boss."

Time study training will give you such an exact knowledge of standard setting and wage incentive computation that you can clearly answer the worker's questions before they become complaints.

Have Up-to-Date Reports

Training in analysis given as part of time study work helps you to anticipate and record explanations of variations in cost. Analytical training will prompt you to insist upon having up-to-date reports which indicate correctly the progress of your department.

If you are well trained as a foreman, you will realize that you cannot make progress without the support and help of your own workers. Therefore, you will take every opportunity to build men up so they can push you ahead.

When you have been trained in time and motion study, you will realize that your worth to the company depends upon your own contributions to its progress. Your attitude will be one of attempting to increase your value by measuring your own accomplishments, the same as you learned to gauge productivity while making time studies.

Safe Practice Shown At Induction Furnace

ON THE front cover of this issue of *American Foundryman* will be seen an interesting photograph. The picture shows an operator at a modern induction furnace melting high-alloy steels for war production work. This alone is important, but the costume of the operator contains even more food for thought. It will be noted that he wears full safety clothing, including hood, shoes, asbestos gloves and coverall, protecting him in his work at the furnace.

In this day of vastly stepped-up production, the safety problem has become one of increasing importance, and it is now being recognized as such by foundry operators. More and more they have come to realize that an injured employee, regardless of what caused his injury and who was responsible for it, means just so much lost war production that can never be replaced. Putting it another way, they are beginning to understand that "Safety Helps Shorten the War."

7 A.F.A. Chapters Set Up Groups to Help Foundries Solve Wartime Problems

FOLLOWING the suggestion made recently to all A.F.A. chapters by C. E. Westover, Executive Vice-President of the Association, seven chapters have now announced the setting up of special War Problem committees to assist members locally in solving war production problems. In operation the groups will endeavor to render direct help on problems of a technical or shop practice nature, or will suggest sources of information where authoritative answers can be obtained.

Chapters who thus far have organized War Problems Committees, and the general Chairmen of the special wartime groups, are as follows:

Chesapeake Chapter — Chairman, E. W. Horlebein, The Gibson & Kirk Co., Baltimore, Md.

Cincinnati Chapter — Chairman, Stanton T. Olinger, Cincinnati Gas & Electric Co., Cincinnati, Ohio.

Detroit Chapter — Chairman, F. A. Melmoth, Detroit Steel Casting Co., Detroit, Mich.

Metropolitan Chapter—Chairman, J. S. Vanick, International Nickel Co., New York City, N. Y.

Quad City Chapter — Chairman, P. T. Bancroft, Republic Coal & Coke Co., Moline, Ill.

St. Louis Chapter — Chairman, C. B. Shanley, Semi-Steel Casting Co., St. Louis, Mo.

Western New York Chapter—Chairman, Wm. S. Miller, Charles C. Kawin Co., Buffalo, New York.

These committees, and those still to be formed by other A.F.A. chapters, have a splendid opportunity to render a most valuable service to the foundry industry in helping to solve "duration" problems quickly, accurately, and without red tape or confusion. Such service is of vital importance in the war production effort, and is characteristic of the objects of the Association: Cooperative effort and mutual helpfulness. The men who volunteer to serve on such committees, without remuneration, deserve special commendation for the spirit of cooperation they thus display.

Western New York Group

The War Problems Committee of the Western New York Chapter consists of eight members serving on sub-committees on gray iron, malleable iron, steel, and non-ferrous matters, under general chairmanship of Wm. S.

Miller. Personnel of the subcommittees, first to be announced by any A.F.A. chapter, are as follows:

Gray Iron—Alex Rankin, Lake Erie Engineering Corp., Kenmore, N. Y.; Martin W. Pohlman, Pohlman Foundry Co. Inc., Buffalo, N. Y.

Malleable Iron—John W. Considine, Jewell Alloy & Malleable Co. Inc., Buffalo; Fred J. Wurscher, Acme Steel & Malleable Iron Works, Buffalo.

Steel—James P. Begley, Pratt & Letchworth Co., Buffalo; Joseph H. Sander, American Radiator & Standard Sanitary Corp., Buffalo.

Non-Ferrous—John C. McCallum, McCallum-Hatch Bronze Co., Buffalo; Harold R. King, Metal & Alloy Specialties Co. Inc., Buffalo.

Metropolitan Group

The organization of the Metropolitan committee is a fine example of what other chapters can work toward, being divided into 12 separate sections, under the general chairmanship of J. S. Vanick. The sections are as follows:

Production, Properties and Specifications of Aluminum, Magnesium and Light Metal Castings — Robt. E. Ward, Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.

Steel Castings—K. V. Wheeler, American Steel Castings Co., Newark, N. J.

Brass and Non-Ferrous Foundry—D. E. Broggi, Neptune Meter Co., Long Island City, New York.

Brass and Non-Ferrous Castings—S. Frankel, H. Kramer & Co., New York, N. Y.

Pig Iron—N. Anderson, Debevoise-Anderson Co., New York, N. Y.

Cupola Practice and Foundry Equipment—H. A. Deane, American Brake Shoe & Foundry Co., Mahwah, N. J.; D. J. Reese, International Nickel Co., New York, N. Y.

Production of Pressure Castings—R. J. Allen, Worthington Pump & Machinery Corp., Harrison, N. J.

Gating and Risering Small Castings—W. T. Dette, Robins Conveying Belt Co., Passaic, New Jersey.

Gating and Risering Heavy Gray Iron Castings — John W. Reid, R. Hoe & Co., Inc., Dunellen, N. J.; David MacIntosh, Sacks-Barlow Foundries, Inc., Newark, N. J.

Cores, Sand and Refractories —W. G. Reichert, American Brake Shoe & Foundry Co., Mahwah, N. J.

Interpretation of Government Specifications—N. A. Kahn, U. S. Navy Yard, Brooklyn, N. Y.

Heat-Resisting Alloy Castings —E. Cook, American Brake Shoe & Foundry Co., Mahwah, N. J.

City Pattern Works Scores a "Bull's Eye" in War Bond Buying

FOUNDRIES of the country are not only doing their part in war production but also are taking over their full share of responsibility in the purchase of War Bonds. To the list of plants which now are "batting 1.000" in buying bonds, the City Pattern Works, Detroit, now can be added.

On August 21, at appropriate ceremonies held at the Detroit plant, the U. S. Treasury Department's coveted "bull's eye" flag was awarded the company. The flag signifies that 100 per cent of the employees of the City Pattern Works now are voluntarily deducting at least 10 per cent of their pay checks to purchase War Bonds.

Vaughan Reid, president of the firm, and a National Director of A.F.A., received the pennant for his company, the presentation being made before the entire plant personnel. In addition to Mr. Reid, Fred J. Coulton, secretary and treasurer, and Leo Bosnak, personnel director of the City Pattern Works, the following participated in the ceremonies: Commander Robert Velz, U. S. Navy; Hon. Edward J. Jeffries Jr., Mayor of Detroit; and P. V. Rilett and H. J. Krutsch of the U. S. Treasury Department.

In accepting the flag Mr. Reid pointed out that the entire company personnel actually are devoting more than "10 per cent of every pay check every pay day," the plant goal in the present nationwide bond buying campaign. For many years both Mr. Reid

Vaughan Reid, President of City Pattern Works, Detroit, receives the Treasury Department's "100 Per Cent War Bond Buying" flag from the hands of Hon. Edward J. Jeffries, Jr., Mayor of Detroit. Left to right, at the flag presentation ceremonies, held August 21 in the company's shop: Commander Robt. Velz, U. S. Navy; Fred J. Coulton, secretary-treasurer of City Pattern Works; Mr. Reid; Mayor Jeffries; P. V. Rilett and H. J. Krutsch, U. S. Treasury Department; and Leo Bosnak, personnel director, City Pattern Works.

City Pattern Works, Detroit, joins the list of patriotic foundries who have received the Treasury Dept. "bull's eye" flag, indicating that 100 per cent of the employees now are deducting 10 per cent of each pay check for purchase of War Bonds. The flag was presented to the company at a ceremony held inside the plant, with all employees looking on proudly.

and his company have been staunch supporters of A.F.A. activities, particularly in connection with the Pattern Division.

A.F.A. Reprints Cost Methods Publications

DUE to the demand for information on foundry cost systems, the A.F.A. Cost Committee has had the Association reprint copies of the proceedings of the 1941, 1937 and 1932 foundry cost sessions. These publications are now known as Reprint 42-45, *Foundry Cost Methods*, and Reprint 41-25, *Classification of Foundry Cost Factors*.

Reprint 42-45 contains:

(a) Simplified Cost System and Foundry Business Record for Gray Iron Foundry Industry.

(b) Cost Methods in the Malleable Iron Industry.

(c) Non-Ferrous Foundry Cost Methods.

(d) Joint Cost Conference.

Reprint 41-25 contains a committee report listing in detail a comparison of cost classifications for the gray iron, steel, nonferrous and malleable foundries.

The A.F.A. Cost Committee, under the chairmanship of Ralph L. Lee, comptroller, Grede Foundries, Inc., Wauwatosa, Wis., has been sponsoring annual convention sessions to discuss the many problems involved in determining the costs of various types of castings. Over the year, a large number of papers have been published, making the Association's bound volumes an excellent source of reference on cost methods.

Recommendations to Buyers

A most recent activity of the Cost Committee has been the appointment of a subcommittee to review the pamphlet "Recommendations to Buyers of Castings," first issued in 1930. C. A. Davis, Caterpillar Tractor Co., Peoria, Ill., heads this committee. The original material now is available in the A.F.A. Cast Metals Handbook.

Seven Committees to Meet in Cleveland

SEVEN committees of the Association will hold meetings during the convention of the American Society for Metals to be held in Cleveland, October 12 to 16, inclusive. The meetings are being held at this time because a large number of committee members attend this convention and the event offers an opportunity to get together to plan activities for the coming year.

The following dates and times of the committee meetings are as follows:

Cupola Research Project Committee—Monday.

Gray Iron Division Committee on High Temperature Properties of Cast Iron—Tuesday morning.

Foundry Sand Research Core Test Committees—Tuesday morning.

Gray Iron Division Advisory Committee—Tuesday noon (luncheon).

Technical Activities Correlation Committee—Tuesday evening.

Foundry Sand Research Committee on Properties of Steel Foundry Sands at High Temperatures — Wednesday morning.

Brass and Bronze Division Advisory Committee—Wednesday afternoon.

The exact time and place of the meetings has not as yet been determined but members of the above committees have been notified of these details. According to present arrangements, the meetings will be held in the Statler Hotel.

Book Review

Handbook of Chemistry and Physics, 25th edition, edited by Chas. D. Hodgman, 5x7, cloth binding, 2503 pages, published by Chemical Rubber Publishing Co., 1900 West 112th St., Cleveland, Ohio. Price, $3.50 in U. S., $4.00 elsewhere.

The uses to which this handbook can be put are almost innumerable. When a student, the reviewer was introduced to the Handbook of Chemistry and Physics as a fine reference book. At that time, it contained some 400 pages and many remarked concerning the completeness of the information given, particularly in the field of chemistry. As a result, the reviewer has kept in touch with new editions and with the issuance of each, has marveled at the increase of valuable information in succeeding issues to 2500 pages.

This handbook represents not just bulk. It represents a fund of worthwhile scientific and technical references that are useful daily in practically any profession or trade. The contents cover data in the fields of mathematics, physics, chemistry and vary from such homely information as barometric pressures to x-ray spectra and atomic numbers.

To anyone in the scientific and technical fields, the reviewer recommends this handbook as a valuable reference book which contains much data often not available elsewhere easily.

ArmaSteel---Cast for a Leading Role in Industry Its Manufacture, Control and Application---II

By Carl F. Joseph,* Saginaw, Mich.

This is the second section of this the Official Exchange Paper of the American Foundrymen's Association to the Institute of British Foundrymen. The first section appeared in the September issue of this magazine. Emphasized in this section is the effect of raw materials on the final product. Such materials include pig iron and coke used in the melting process. The final section will deal with inspection control and typical uses of ArmaSteel.

AT our plant silvery pig iron and coke are two of the principal raw materials affecting the properties of the product, and both are properly controlled. Heredity is common to both pig iron and coke and many bad experiences in the past have been traced directly to these two materials. Close control of both of these materials at the source is maintained. Figure 3 illustrates the data obtained at the blast furnace on every run of silvery pig iron. No changes in blast furnace raw materials or operations are made without consulting the foundry. Naturally, chemical composition must be relied upon in making up the cupola charge, but it is only a means of control in the successful operation of the cupola and offers very little in the way of solving the many metal troubles experienced in the foundry. Even with close chemical control in the foundry, there are chances for variation in the finished product which can often be traced back to the ores or fuel used in the blast furnace burden or the blast furnace practice. In general, the pig iron producer has no difficulty in meeting chemical specifications for carbon, silicon, manganese, sulphur and phosphorus. Even alloys are absent to a degree which might cause any trouble. Microscopic examination of the pig iron is a routine test of the greatest importance. From the annealability angle, the microstructure of the pig iron should reveal little or no steadite. In the past this structure has definitely shown that the iron will anneal with difficulty when large amounts of steadite are present.*

Figure 4 (Left)—shows the

*Research Metallurgist, Saginaw Malleable Iron Div., General Motors Corp.

*Joseph, C. F., and Boegehold, A. L., "High Silicon Pig Iron for Malleable Iron Manufacture," *Transactions*, American Foundrymen's Association, vol. 40, pp. 241-265 (1932).

QUALITY OF IRON AS AFFECTED BY BLAST FURNACE PRACTICE

PIG IRON—BLAST FURNACE DATA

1. Furnace No.....Location .....
2. Superintendent .....Date Produced.....
3. Composition of Ores:

Name						
Fe	.....	.....	.....	.....	.....	.....
Phos.	.....	.....	.....	.....	.....	.....
Si O_2	.....	.....	.....	.....	.....	.....
Al $2O_3$	.....	.....	.....	.....	.....	.....
CaO	.....	.....	.....	.....	.....	.....
MgO	.....	.....	.....	.....	.....	.....
Mn	.....	.....	.....	.....	.....	.....
Percent	.....	.....	.....	.....	.....	.....
Pounds	.....	.....	.....	.....	.....	.....

4. Coke Charge.....lbs. Coal Charge.....lbs.
5. Rounds per day..... Analysis:
6. Kinds of Coke: Fixed Carbon.....
   1. Shatter Test..... Vol. Hydro C.....
   2. True Sp. Gr..... Ash .....
   3. App. Sp. Gr..... Sulphur .....
   4. Porosity ..... Water .....
7. Burning Characteristics of Coke:
   1. Av. Temp. Rise.....
   2. Av. Time for 250° Temp. Rise.....
   3. Ignition Temp.....
8. Kind of Coal..... Analysis:
   Fixed Carbon.....
   Vol. Hydro C.....
   Ash .....
   Sulphur .....
   Water .....
9. Limestone Source ..... Analysis:
   $CaCO_3$ ..... CaO ..... Lbs. of limestone per round.....
   $MgCO_3$ ..... MgO..... Lbs. of limestone per ton.....
   Oxide .....
   SiO_2 .....
   .....
10. Blast Temp..... Max..... Min..... Cycle.....
11. Blast Pressure..... Av. lbs. per sq. in..... Max..... Min.....
12. Air per minute.....cu. ft. .....lbs.
13. Fuel burned per hour.... lbs. ....lbs. per sq. in area at max. dia.....
14. Pounds of air per pound of fuel..... Air. per lb. of carbon.....
15. Blast velocity through tuyeres .....ft. per min.
16. Composition of top gases.....% CO.....% CO_2.....% H.....% H.....
17. Temp. of top gases.....%
18. Burden per hour..... lbs.....lbs. per sq. ft. area at max. dia.....
19. Composition of slag.....(flushing slag)
    Si O_2 ....
    Al $2O_3$ .... Appearance of slag.....
20. Weight of iron produced per hour.....lbs.
    Weight per sq. ft. area at max. dia. per hour.....lbs.
21. Depth of metal in hearth at tapping.....ft.
22. Casting Temp.....max.
    .....min.
    .....av.
23. Time between casts.....hrs.
24. Dimension of furnace:

1. Stock line to tuyeres	.....ft.	.....in.
2. Tuyere level to hearth	.....ft.	.....in.
3. Size and number of tuyeres	.....	
4. Iron notch to conder notch	.....ft.	.....in.
5. Dia. of hearth	.....ft.	.....in.
6. Dia. at top of both	.....ft.	.....in.
7. Cubical contents of furnace	.....cu. ft.	

25. Number of stoves..... In use..... Heating up.....
26. Chemical Analysis:

AVERAGE OF FIVE PIGS

T.C.	C.C.	Si.	Mn.	P.	S.
.....	.....	.....	.....	.....	.....

27. Atmospheric temperature degs. F. .....max.
    .....min.
    .....av.
28. Barometric press .....in Hg.
29. Humidity..... .....grs. per cu. ft.

Fig. 3—Chart showing data obtained at the blast furnace for making silvery pig iron.

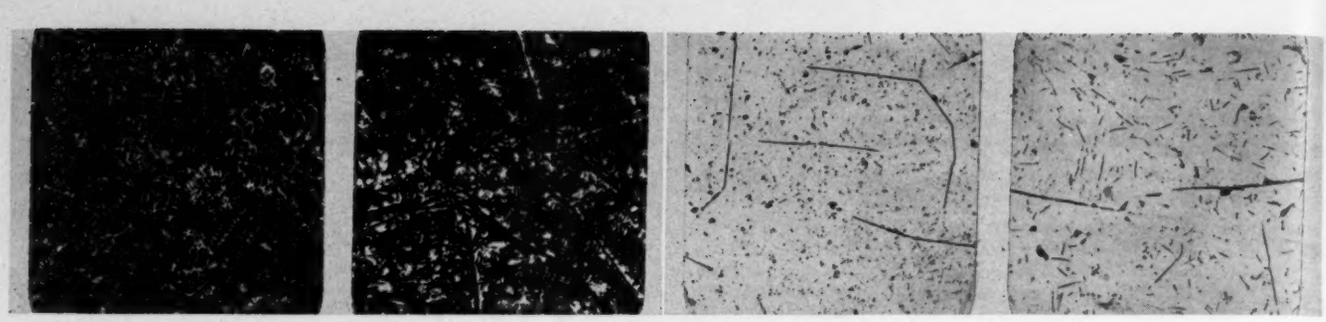


Fig. 4 (left to right)—Micrographs of 10 per cent silicon pig iron. The two on left show pig irons with Steadite and without Steadite respectively. The pig iron shown in the first micrograph gave poorly annealed castings while the second gave castings that annealed properly. The two micrographs on right show small and medium sized graphite flakes, respectively, which appeared in two different lots of 10 per cent silvery pig iron. Specimens for graphite size were taken from the center of the respective pigs.

amount of steadite present in good and troublesome pig iron. Steadite in even small amounts is undesirable in pig iron to produce castings for the short cycle malleablizing process.

many cases are highly polished, it is extremely important that the castings have small temper carbon spots. Large carbon spots affect the machinability adversely. Therefore, in order to

the casting. As mentioned before, ores, coke and blast furnace practice affect the properties of the iron and this is particularly true regarding size of graphite in pig iron.

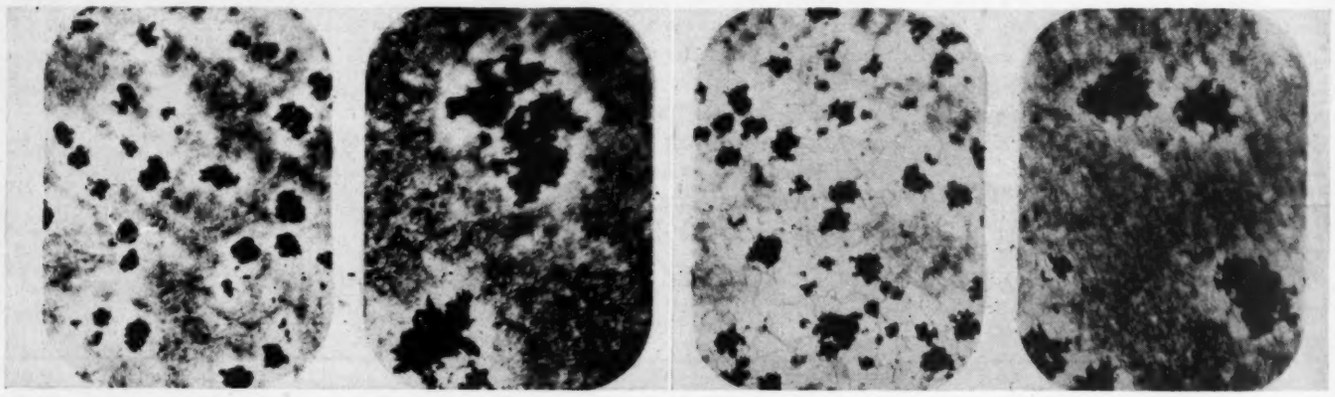


Fig. 5—Left to Right: (A)—Micrographs of ArmaSteel made with pig iron containing small graphite flakes. (B)—Same made from pig iron containing medium-sized graphite flakes. Both specimens drawn to a Brinell hardness of 207. (C and D)—Micrographs of castings made from same pig irons as in (A) and (B) but drawn to a Brinell hardness of 170.

Graphite Size as Influenced by Pig Iron

Graphite size in the pig iron has a marked influence on the properties of the resultant castings. Since ArmaSteel parts in

produce the most satisfactory castings as regards surface finish and machinability, a study of the graphite size in pig iron is of utmost importance as it directly affects the carbon spots of

Figure 4 (Right)—represents small and medium graphite flakes respectively in two different pigs. Micrographs were taken from the center of the pig.

Figure 5 (A and B)—repre-

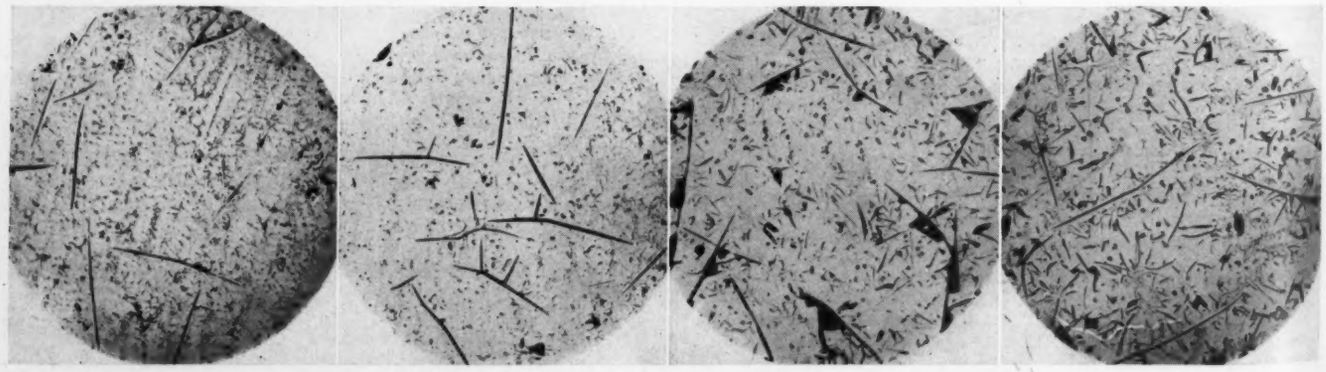


Fig. 6—Micrographs illustrating the effect of rate of cooling of pig iron through and after solidifying in the mold. Left to Right: (A) Sample of pig iron taken from first portion of cast and cooled completely through water spray. (B) Micrograph of last portion of pig iron cast and cooled completely through water spray. (C) Micrograph of pig iron from middle portion of the cast and removed when only half way through cooling spray. (D) Micrograph of pig iron taken from middle portion of cast and cooled in air. All micrographs taken at center of the pigs at x100.

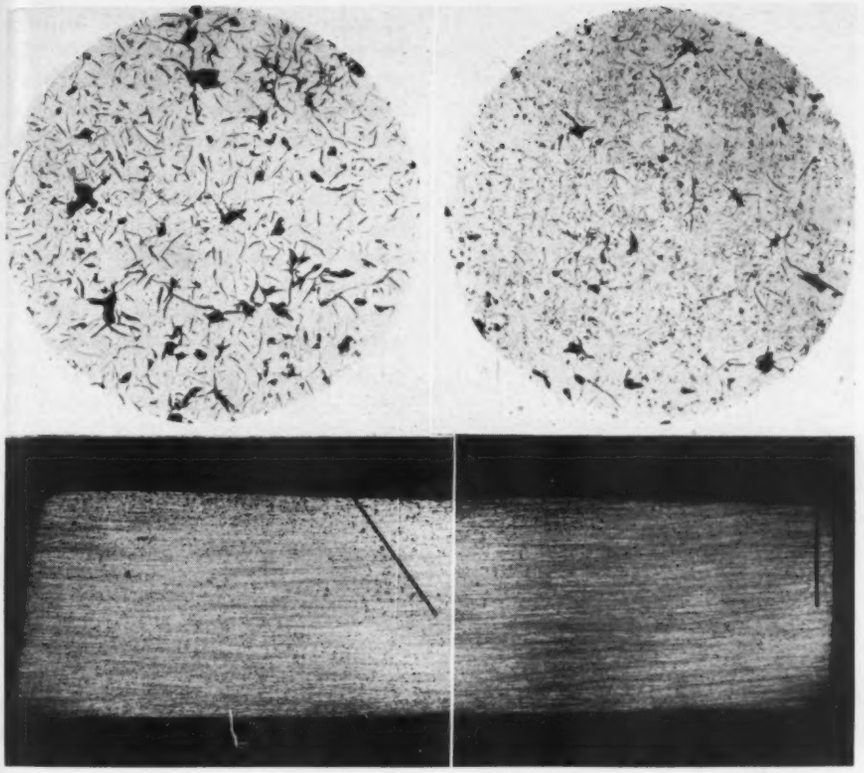


Fig. 7—Top: Micrographs of 10 per cent silicon pig iron cast in copper mold without coating of lime wash. (Left) Structure at center of pig. (Right) Structure near bottom surface. Bottom: Surface of respective pigs, fine ground but not polished.

sents ArmaSteel produced from pig iron shown in the two right-hand micrographs of Fig. 4, respectively, drawn back to a Brinell of 207. Fig. 5 (C and D) represents ArmaSteel produced from pig iron shown in the two right-hand micrographs of Fig. 4, respectively, drawn back to a Brinell of 170. Note the large variation in size of the temper carbon in the ArmaSteel produced by each of the two pig irons of like chemical analysis. Large graphite in the pig iron is carried through the melting operation to the malleablized structure of the annealed casting.

Pig Iron Practice vs. Graphite Size

The micrographs shown in Fig. 6 indicate the effect on rate of cooling of the pig iron through and after solidifying in the mold. All micrographs taken from center of pig at 100 magnification. The lower two micrographs show larger graphite flakes.

There is a definite tendency to coarsen the primary graphite on slow cooling through solidification range. The rate of cooling after solidification has no effect on the coarseness of the graphite.

Some work has been done to determine the effect of graphite in pig iron produced by casting metal into copper molds vs. steel molds. Figure 7 shows pig iron cast in a copper mold without lime wash. Figure 8 shows pig iron in old steel mold with lime wash. Figure 9 shows pig iron in new steel mold with lime wash.

Figure 10 is a photograph of polished sections of high silicon pig iron cast in uncoated copper mold and in coated steel mold. The fact that pig iron cast in a copper mold shows a sounder iron, in which the graphite flakes are much finer than the same iron poured into a steel mold, is an indication of better casting practice and is a step in the right direction. The casting of smaller and thinner pigs produces a somewhate finer graphite size.

Figure 11 shows micrographs taken near the surface and at the center of a 38-42-lb. pig. These show a better graphite size than the heavier pig.

The pig iron producer will be called upon more and more in the future to help the foundryman solve some of his troubles, and graphite size of pig iron is only one of them.

Coke

In the duplex process, in which the cupola is used as the melting

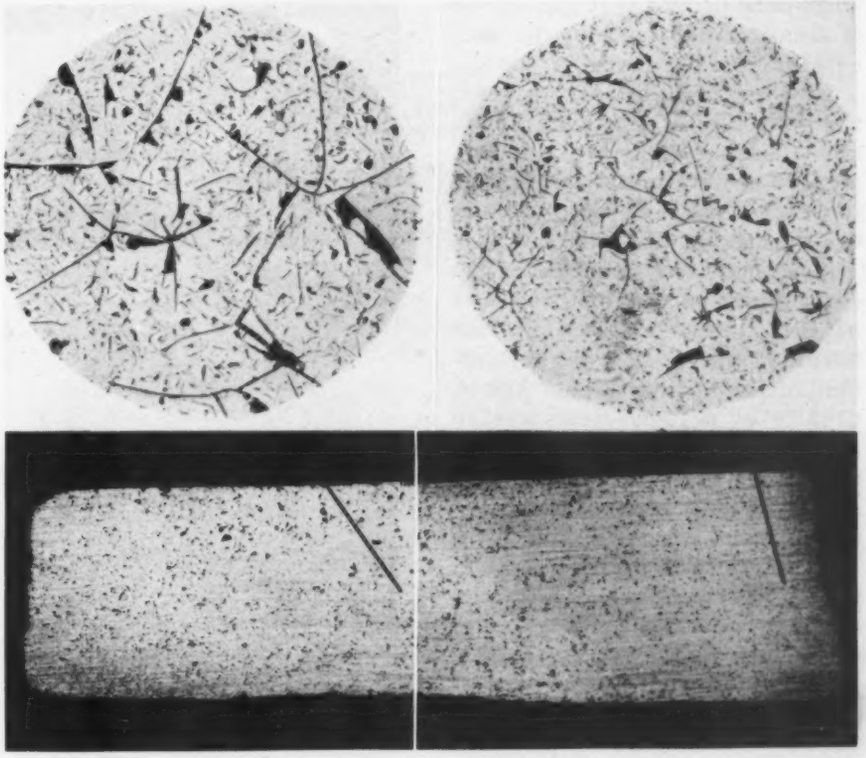


Fig. 8—Top: Micrographs of 10 per cent silicon pig iron cast in old steel mold coated with lime wash. (Left) Structure at center of pig. (Right) Structure near bottom surface of pig. Bottom: Surface of respective pigs, fine ground but not polished.

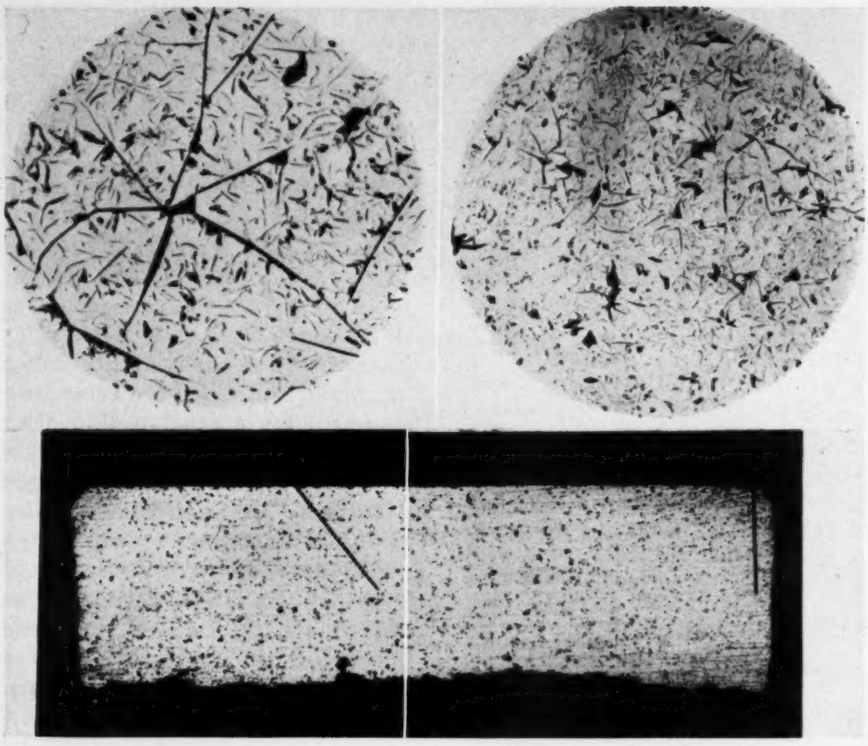


Fig. 9—Top: Micrographs of 10 per cent silicon pig iron cast in new steel mold coated with lime wash. (Left) Structure at center of pig. (Right) Structure near bottom surface of pig. Bottom: Surface of respective pigs, fine ground but not polished.

medium, coke plays a major role in the production of quality metal. Many foundrymen prefer poor melting stock to poor coke. That only proves that good coke is almost a necessity in the successful operation of the cupola.

In the classification of coke, the author likes to refer to slow and fast burning coke. The method of determination of burning rates has been described in the literature.*

Northern coke, produced from coals mined in the northern part of the United States, are fast burning and produce higher carbon metal at the cupola spout, usually at a lower temperature than that obtained from southern coke, produced from coals mined in and around the State of Alabama, which is slow burning and produces a low carbon metal. Regardless of the coke source, it is desirable to have uniformly sized coke, free from green ends and porosity.

There is some question among foundrymen regarding the size of coke. Some like large chunks (6 to 8-in. across); others like small chunks (2 to 3-in. across). The diameter of the cupola has considerable bearing on the most desirable size. In the operation of a 102-in. diameter cupola, coke the size of two fists (about 4 to 5-in. across) is giving satisfactory results.

Many bad experiences in the past in maintaining close carbon control on cupola metal has prompted much investigation on the major source of carbon, which is coke. The metallurgical coke used in the production of low carbon cupola metal performs two functions. First, it supplies the heat to melt the iron and steel charge, and, secondly, it carburizes the charge, raising the carbon from an average of 1.40 per cent to 2.60 per cent. To maintain the molten metal to

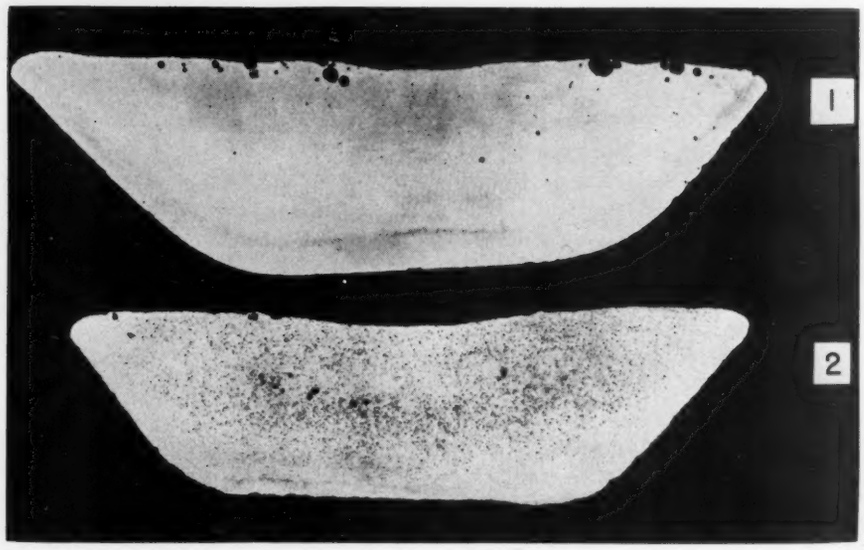


Fig. 10—Photographs of polished sections of 10 per cent silicon pig iron. (1) Cast in uncoated copper mold. (2) Cast in coated steel mold.

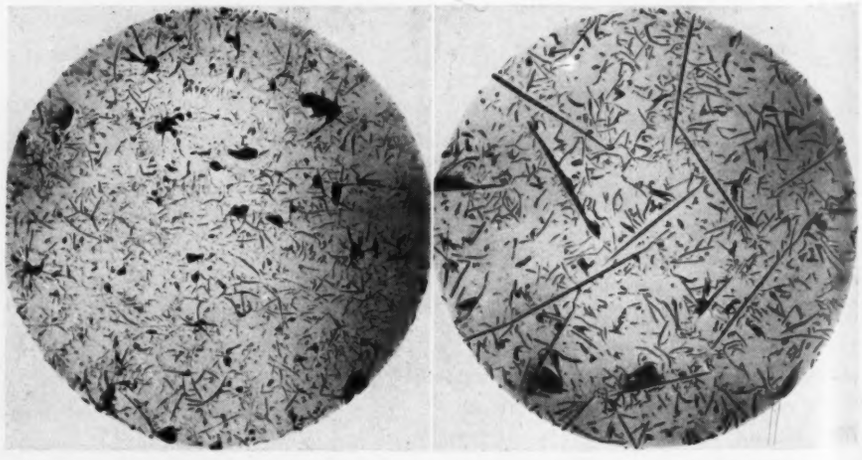


Fig. 11—Micrographs of 10 per cent silicon pig iron, chill cast and cooled in air. (Left) Structure at 1/4-in. from surface of mold. (Right) Structure at center of pig.

*Boegehold, A. L., *"Quality of Pig Iron and Castings as Affected by Blast Furnace Practice,"* Transactions, American Foundrymen's Association, vol. 37, pp. 91-152 (1929).

within the desired 10 point range, one must have a coke which will meet rigid specifications.

Close control must be maintained at all times and any changes immediately relayed to the foundry. Sometimes minor changes in the coals used in the coal mix have a major influence on the properties of the metal. To maintain close control of our coke, we require periodic reports from the coke ovens covering all important points in their operation and raw materials used. No changes are made without first advising the foundry. Figure 12 is an example of the coal and coke data furnished periodically to the metallurgical department.

(The third and final section of this paper will appear in the November issue of *American Foundryman.*)

PRODUCTION DATA ON FOUNDRY COKE

1. Name of Oven..... Location of Oven..... Superintendent.....
2. Composition of Coals:
   - Name.....
   - Source.....
   - Moisture.....

Fixed Carbon	.....	.....	.....
Volatile Matter	.....	.....	.....
Ash	.....	.....	.....
Sulphur	.....	.....	.....

3. Ash Analysis:

SiO_2	.....	.....	.....
Fe_2O_3	.....	.....	.....
Al_2O_3	.....	.....	.....
Ca O	.....	.....	.....
Mg O	.....	.....	.....
Fusion Test	.....	.....	.....

4. Composition of Coal Mix:

Per cent	.....	.....	.....

5. Coal Sizing.....% thru ⅛" sieve.....% thru ¼".....% thru.....
6. Time Coal exposed to weather.....
7. Coke Ovens:
   1. Number running on our coke.....
   2. Size of ovens .....in. wide .....ft. high .....ft. lg. .....
   3. Weight of coal per oven.....tons dry
   4. Weight of coke obtained per oven.....tons dry
8. Coking Temperature.....degs. F.
9. Time at coking temperature.....hrs.
10. Are coke ovens running primarily for the making of coke or gas.....
11. Is control of operation stressed.....
12. Is the management progressive and open minded.....
13. Combustion Tests:
    1. Av. rise in temperature.....
    2. Av. time for 250° temp. rise in.....min.
    3. Ignition temp.....
14. Coke Analysis:
    - Fixed carbon.....
    - Vol. Comb. matter.....
    - Ash .....
    - Sulphur .....
15. Shatter Test: .....% on 2" square screen
16. Structure of Coke:
    1. Cross fractured
    2. Soft
    3. Cell structure
17. Physical Properties:
    1. Apparent specific gravity
    2. True specific gravity
    3. Porosity
    4. Carburizing action

Fig. 12—Example of coal and coke data supplied by manufacturer to Metallurgical Department.

New High Temperature Sand Group Personnel

SUBCOMMITTEE 6b7 on Physical Properties of Steel Foundry Sands at Elevated Temperatures of the Foundry Sand Research Committee, which is supervising the study of physical properties of various steel foundry sands and binders at elevated temperatures, has undergone some changes in personnel. The subcommittee as now constituted consists of the following members:

D. L. Parker, General Electric Co., Everett, Mass., *Chairman.*

C. W. Briggs, Steel Founders' Society of America, Cleveland.

H. W. Dietert, Harry W. Dietert Co., Detroit.

Werner Finster, Reading Steel Casting Div., American Chain & Cable Co., Reading, Pa.

R. A. Gezelius, General Steel Castings Corp., Eddystone, Pa.

Howard Mason, Symington-Gould Corp., Depew, N. Y.

C. P. Randall, Eastern Clay Products, Inc., Eifort, Ohio.

J. A. Rassenfoss, American Steel Foundries, East Chicago, Ind.

W. G. Reichert, American Brake Shoe & Foundry Co., Mahwah, N. J.

Mr. Rassenfoss, a new member of the subcommittee, succeeds G. A. Lillieqvist, Chief Metallurgist, American Steel Foundries, East Chicago, Indiana, who resigned and proposed Mr. Rassenfoss as that company's representative on this subcommittee. During the past year, the subcommittee lost by death Prof. A. C. Davis, Head, Experimental Engineering Dept., Cornell University, under whose direction the high temperature investigation was being carried on. In his place, Prof. J. R. Moynihan of Cornell University, who probably soon will be appointed Head of the Experimental Engineering Dept., has been appointed to the subcommittee.

This subcommittee has issued three reports on the investigation and another is in the process of preparation. Another report will be presented at the next convention of the American Foundrymen's Association. Members interested in the activities of this subcommittee may purchase copies of the reports issued by addressing the communication to the Association.

Army-Navy "E" Award To Saginaw Steering

ANOTHER award for excellence in war production was given a member of the foundry industry (and, incidentally, an A.F.A. member as well) with presentation of the Army-Navy "E" award to the Saginaw Steering Gear Division of General Motors Corp., Saginaw, Mich., on

Sept. 8. The "E" pennant which accompanied the award, signifies that the plant has exceeded all production expectations.

A colorful program accompanied the presentation at the plant, with W. H. Doerfner, general manager, accepting the award from Col. A. B. Quinton Jr., U. S. A., chief of the Detroit Ordnance District. "E" pins also were presented, to be worn by each employee of the division.

Guests included C. E. Wilson, president, General Motors Corp.; Hon. Murray D. VanWagoner, Governor of Michigan; Hon. Wm. J. Brydges, Mayor of Saginaw, and Maj. Paul F. Taft of the Detroit Ordnance District. The "E" pennant was hoisted by an American Legion color guard, to music by the Fort Custer Band.

A.F.A. Announces Essay Contest For Engineering School Students

A NEW Student Essay Contest for engineering school undergraduates, to be known as the A.F.A.-S. Obermayer Student Essay Competition, has just been announced by the Association. The competition, sponsored by the A.F.A. Committee on Cooperation with Engineering Schools, begins immediately and all entries must be in by March 10, 1943, according to Fred G. Sefing, International Nickel Co., New York, chairman of the committee.

A first prize of $100 will be given for the best essay submitted dealing with the foundry, and a second prize of $50. Funds for prizes have been made available by the A.F.A. Board of Awards, using income from a fund donated by the S. Obermayer Co., Chicago. In selecting subjects, contestants may consult with engineers, foundrymen and foundry teachers in their localities.

The purpose of the contest is "to arouse interest among undergraduate engineering students to the exceptional opportunities the foundry industry offers for constructive work in one of the most fascinating fields of metal processing and to emphasize the extended advantageous use of castings in many fields."

Prominent men of the industry will comprise the jury of award which will judge the essays and select the winning entries, winners to be announced at the annual meeting of A.F.A. to be held in the spring of 1943. Detailed information on the contest may be obtained from the Secretary, American Foundrymen's Association, 222 W. Adams St., Chicago, Ill., to whom all contest entries should likewise be sent.

Studying Uses of High Temperature Cast Iron

A COMMITTEE for the study of "High Temperature Properties of Cast Iron" is now being organized by the A.F.A. Gray Iron Division. War production efforts of foundries recently have accented the need for showing engineers the possibilities of cast iron under higher temperature conditions than are usually permissible under such codes as the A.S.M.E. Boiler Code. Greater use made of cast iron will, of course, release steel and other critical materials needed for war work.

The new A.F.A. committee will be headed by R. M. Allen, Worthington Pump & Machinery Corp., Harrison, N. J., and a national Director of the Association, and will cooperate in its study with a similar committee sponsored by the American Society for Testing Materials. The A.S.T.M. committee, a subcommittee of A-3 on Cast Iron, will be under chairmanship of J. S. Vanick, International Nickel Co., New York.

Progress reports will be published as the committee accumulates data to be supplied to the engineering profession. Meanwhile, personnel of the new A.F.A. committee is shown on pages 17-24 of this issue.

Ohio Injector Gets Army-Navy "E" Award

FOR unusual achievement in production of war materials, the Ohio Injector Co., Wadsworth, Ohio, was recently awarded the new Army-Navy "E," presentation being made August 26 at ceremonies held in the company's new steel valve plant. Thus Ohio Injector becomes one of the first, if not the first, valve manufacturing plants to receive

When Racine, Wis., held a city-wide Victory Parade recently, Belle City Malleable Iron Co. and affiliated Racine Steel Castings Co. entered a unique float illustrating the foundry industry's contribution toward winning the war.

P. M. Arnall (right) executive vice president of the Ohio Injector Co., Wadsworth, Ohio, displays with Capt. R. P. Schlabach, U. S. N., the Army-Navy "E" pennant awarded his company for outstanding war production effort.

the armed services' joint award for excellence in war production.

Several thousand employees, their families and friends witnessed the impressive ceremonies, at which the "E" pennant was received and acknowledged by P. M. Arnall, executive vice president of Ohio Injector Co. Presentation of the pennant was made by R. P. Schlabach, U. S. Navy, and the accompanying "E" pins for employees were presented by Lt. A. R. Staudt, U. S. Naval Reserve. Among the guests were Hon. John W. Bricker, governor of Ohio, and visiting Army and Navy officials.

The Ohio Injector Co. has been a steady supporter of A.F.A. for some time, maintaining a Company membership and a number of Affiliate memberships. E. F. Hess, metallurgical engineer, has served on many Association committees, and is a past President of the Northeastern Ohio Chapter.

Chapters Aiding in Support Of Cupola Research Project

ONE of the most gratifying aspects of the organization and progress of the Cupola Research Project sponsored by the American Foundrymen's Association is the splendid support being given the work by members of the various A.F.A. chapters. In addition to the work of the Detroit Chapter, which has oversubscribed its suggested quota, the Chicago, Chesapeake, Central New York and Northern California chapters have been doing especially active work.

Detroit Over the Top

Under the exceptionally able leadership of E. C. Hoenicke, foundry division, Eaton Mfg. Co., Detroit, that chapter has more than subscribed the suggested quota assigned for that district. As a result, members of the Cupola Research Project have expressed their appreciation to Mr. Hoenicke and the members of his committee for their able support.

Operation Manual Progresses

The various subcommittees of the project have been making good headway of late in preparation for criticism and final publication of sections of the cupola operations manual. With the Fall season of chapter meetings now here, it is expected that this work will be greatly expedited.

A meeting of the Steering Committee is planned for Cleveland on October 12, according to Project Chairman D. J. Reese, International Nickel Co., New York. Material submitted by the subcommittees is to be reviewed at that time.

Additional Sponsors

Since publication of long lists of contributors to the project in the July and August issues of *American Foundryman*, considerable additional contributions have been received, as shown below. Limited space does not permit individual acknowledgment at this time of the many foundrymen, metallurgists and others who are giving their best efforts to complete the operations manual. On its completion, the manual undoubtedly will be heartily welcomed by the foundry industry, especially those who now contemplate utilizing the cupola as a melting furnace.

Cupola Research Project

Additional 1941-42 Pledges, as of September 16, 1942

Acme Foundry Co., Detroit.
Andes Range & Furnace Corp., Geneva, N. Y.
Bauer Wilson & Bateman, Chicago.
Bostick Foundry Co., Lapeer, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Edward G. Budd Mfg. Co., Detroit.
Central Specialty Co., Ypsilanti, Michigan.
Chrysler Corp., Dodge Div., Hamtramck, Mich.
Cummings Moore Graphite Co., Detroit.
Detroit Brass & Malleable Works, Detroit.
Detroit Gray Iron Foundry Co., Detroit.
Enot Foundry Co., Wayne, Mich.
Fearon Foundry Co., Chicago.
General Metals Corp., Oakland, Cal.
General Refractories Co., Philadelphia.
Griffin Wheel Co., Chicago.
Hansell-Elcock Co., Chicago.
Industrial Castings Co., Detroit.
Ingersoll-Rand Co., Painted Post, New York.
Kelsey Hayes Wheel Co., Detroit.
Kennedy Valve Mfg. Co., Elmira, New York.
Lindgren Foundry Co., Batavia, Ill.
Love Brothers Inc., Aurora, Ill.
National Foundry Sand Co., Detroit.
S. Obermayer Co., Chicago.
Ohio Ferro Alloys Corp., Canton, O.
Pangborn Corporation, Hagerstown, Maryland
Pyle National Co., Chicago.
Claude B. Schneible Co., Chicago.
Schwarb Foundry Co., Detroit.
Warner R. Thompson Co., Detroit.
United States Radiator Co., Detroit.
Utica Steam Engine & Boiler Works, Utica, N. Y.
Western Materials Co., Chicago.
Wilson Foundry & Machine Co., Pontiac, Mich.
Wisconsin Steel Co., Chicago.
E. J. Woodison Co., Detroit.
Woodruff & Edwards Inc., Elgin, Ill.

CHAPTER OFFICERS

J. Ralph Turner
Queen City Sand & Supply Co.
Buffalo, N. Y.
Director
Western New York Chapter

Delbert G. Luper
Grayson Heat Control Co., Ltd.
Lynwood, Calif.
Director
Southern California Chapter

Wm. E. Jones
Ordnance Steel Foundry Co.
Bettendorf, Iowa
Vice-Chairman
Quad City Chapter

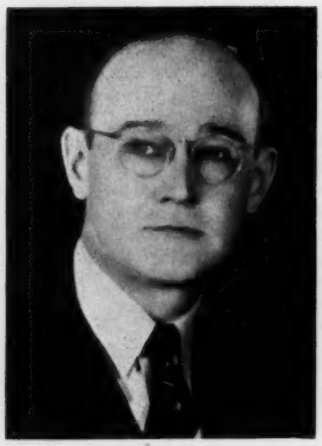
Wayne B. Nelson
Young & Vann Supply Co.
Birmingham, Ala.
Director
Birmingham Chapter

C. H. Cousineau
West Michigan Steel Foundry Co.
Muskegon, Mich.
Treasurer
Western Michigan Chapter

R. A. Minnear
Ingersoll-Rand Co.
Painted Post, N. Y.
Director
Central New York Chapter

V. F. Stine
Pangborn Corp.
Hagerstown, Md.
Director
Chesapeake Chapter

S. L. Cameron, Jr.
Valley Iron Works
St. Paul, Minn.
Director
Twin City Chapter



J. W. Horan
Sandusky Foundry & Machine Co.
Sandusky, Ohio
Director
Northeastern Ohio Chapter

Wm. E. Goff
J. I. Case Co.
Rockford, Ill.
Director
Northern Illinois-
Southern Wisconsin Chapter

M. L. Doelman
Electric Steels, Ltd.
Cap de la Madeleine, Quebec
Director
Eastern Canada and Newfoundland
Chapter

Luther A. Kleber
General Steel Castings Corp.
Granite City, Ill.
Vice-Chairman
St. Louis District Chapter

Over 400 Foundrymen Volunteer For A.F.A. Committees In Vital War Year

ON THE following eight pages the American Foundrymen's Association presents the new National Committee Personnel that will carry on A.F.A. technical activities in the coming year. Never in the history of the industry has committee work been charged with so much responsibility as now, with the problems of war production becoming more important daily.

Activities of some committees have necessarily been curtailed because of the war, but the work of many others should be greatly stimulated. All A.F.A. members should display greater interest than ever before in the work of these committees, in many cases directly applied to winning the war.

This year over 400 prominent members of the foundry industry, each a specialist in his particular field, have volunteered to serve on nearly 110 separate committtees and subcommittees of the Association. In addition, A.F.A. representatives are serving on some 37 committees and subcommittees of other technical societies. To all these men the Foundry Industry owes a unanimous vote of thanks for their spirit of cooperation in giving of their time, when time is at such a premium today, to help advance the processes, practices and products of a Foundry Industry at War.

A.F.A. National Committee Personnel* --- 1942-1943

BOARD OF DIRECTORS

D. P. Forbes, *President*
L. C. Wilson, *Vice President*

R. J. Allen
G. W. Cannon
B. D. Claffey
J. G. Coffman
J. E. Crown
M. J. Gregory
Vaughan Reid
Harold J. Roast
L. P. Robinson
L. N. Shannon
H. S. Simpson
I. R. Wagner
H. S. Washburn
S. V. Wood
W. L. Woody

Executive Committee

D. P. Forbes, *Chairman*
L. C. Wilson
B. D. Claffey
H. S. Simpson
H. S. Washburn
C. E. Westover
S. V. Wood

Advisory Board

H. S. Simpson *(President 1941-42)*
L. N. Shannon *(President 1940-41)*
H. S. Washburn *(President 1939-40)*
Marshall Post *(President 1938-39)*
H. Bornstein *(President 1937-38)*
James L. Wick, Jr. *(President 1936-37)*
D. M. Avey, *(President 1934-36)*
Frank J. Lanahan *(President 1933-34)*
T. S. Hammond *(President 1932-33)*
E. H. Ballard *(President 1931-32)*
N. K. B. Patch *(President 1930-31)*
S. Wells Utley *(President 1926-28)*
A. B. Root, Jr. *(President 1925-26)*
L. W. Olson *(President 1924-25)*
G. H. Clamer *(President 1923-24)*
W. R. Bean *(President 1920-22)*
B. D. Fuller *(President 1917-18)*
H. D. Miles *(President 1912-13)*
Arthur T. Waterfall *(President 1909-10)*
L. L. Anthes *(President 1908-09)*
W. H. McFadden *(President 1906-07)*
Chris. J. Wolff *President 1904-05)*

Staff

C. E. Westover, *Executive Vice President and Treasurer*
C. E. Hoyt, *Convention and Exhibits Manager*
R. E. Kennedy, *Secretary*
N. F. Hindle, *Assistant Secretary*
J. Reininga, *Assistant Treasurer*

SPECIAL COMMITTEES

Board of Awards

H. S. Simpson, *Chairman (President 1941-42)*
L. N. Shannon *(President 1940-41)*
H. S. Washburn *(President 1939-40)*
Marshall Post *(President 1938-39)*
H. Bornstein *(President 1937-38)*
James L. Wick, Jr. *(President 1936-37)*
D. M. Avey *(President 1934-36)*

Nominating Committee

H. S. Washburn, *Chairman (President 1939-40)*
L. N. Shannon *(President 1940-41)*
H. S. Simpson *(President 1941-42)*

Elected Members:
John Lowe
John W. Porter
H. M. St. John
R. J. Teetor

*Unless another member of the National Office staff is listed as a member or secretary of a committee or group of committees, all communications on committee activity should be addressed to R. E. Kennedy, Secretary, American Foundrymen's Association, 222 W. Adams Street, Chicago, Ill.

COMMITTEES OF BOARD OF DIRECTORS

Membership Committee

B. D. Claffey, *Chairman*
(Committee personnel to be announced)

War Activities Committee

D. P. Forbes, *Chairman*
H. Bornstein
W. Romanoff
F. A. Melmoth
F. J. Walls

Technical Activities Correlation Committee

F. J. Walls, *Chairman*
H. Bornstein
R. J. Allen
Lee C. Wilson
J. E. Crown

Conferees:
C. E. Sims
A. M. Fulton
W. Romanoff
N. E. Woldman
Vaughan Reid
Dr. H. Ries
H. M. St. John
F. G. Sefing
D. J. Reese

General Papers Review Committee

F. J. Walls, *Chairman*
C. E. Sims
A. M. Fulton
W. Romanoff
N. E. Woldman
Vaughan Reid

Publications Committee

H. Bornstein, *Chairman*
N. F. Hindle, *Secretary*
R. J. Allen
H. M. St. John
F. J. Walls

Lecture Course Committee

H. M. St. John, *Chairman*
H. Bornstein
John Howe Hall
F. J. Walls

Sand Testing Handbook Revision Committee

Dr. H. Ries, *Chairman*
N. J. Dunbeck
C. Mathiesen
H. W. Meyer
W. G. Reichert
H. H. Wilder

Alloy Cast Irons Book Revision Committee

Subcommittee on Metallurgical Theory

Alfred Boyles
V. A. Crosby
J. T. MacKenzie

Subcommittee on Alloying Elements

L. F. Lottier, *Chairman*
B. H. Booth

Subcommittee on Properties

C. H. Lorig, *Chairman*
G. F. Comstock
V. A Crosby
W. W. Kerlin
R. G. McElwee
E. K. Smith
F. J. Walls

Subcommittee on White and Chilled Iron

S. C. Massari, *Chairman*
John Erler
L. H. Rudesill

Subcommittee on Heat Treatment

J. S. Vanick, *Chairman*
W. E. Jominy
S. C. Massari
R. G. McElwee
G. P. Phillips
G. A. Timmons

Subcommittee on Foundry Practice

H. C. Aufderhaar
T. E. Barlow
N. H. Boardman
V. A. Crosby
W. A. Hambley
C. H. Morken
D. J. Reese
E. L. Roth
F. J. Walls

Note: For companies and addresses of committee members see section on Addresses of Committee Personnel beginning on page 21.

Subcommittee on Processed Irons

T. E. Barlow, *Chairman*
C. O. Burgess
T. E. Eagan
J. T. Eash
Chas. Hardy
R. F. Harrington
R. G. McElwee
G. A. Timmons

Subcommittee on Specific Applications

G. P. Phillips, *Chairman*
R. J. Allen
H. C. Aufderhaar
H. S. Austin
J. C. Bancroft
T. E. Barlow
N. H. Boardman
R. A. Clark
G. F. Comstock
V. A. Crosby
W. E. Day, Jr.
T. E. Eagan
W. P. Eddy, Jr.
D. P. Forbes
C. D. Galloway III
J. H. Gellert
A. E. Hageboeck
W. A. Hambley
J. E. Jackson
W. E. Jominy
P. S. Lane
J. T. MacKenzie
R. H. McCarroll
C. R. McGrail
Harold Myers
C. J. Rittinger
W. H. Rother
W. H. Spencer
L. B. Thomas
N. F. Tisdale
F. J. Walls
M. Warchol
Donald Webster
R. E. Wilke
F. T. Williams

Cast Metals Handbook Revision Committee

Gray Iron Division

C. O. Burgess, *Chairman*
A. L. Boegehold
J. W. Bolton
Bureau of Ships, Navy Dept.
V. A. Crosby
A. C. Denison
J. O. Draffin
T. E. Eagan
O. E. Goudy
Robt. Gregg
C. H. Lorig
J. T. MacKenzie
W. E. Mahin
S. C. Massari
R. G. McElwee
G. P. Phillips
E. K. Smith
J. C. Stavert
J. S. Vanick
F. J. Walls

Steel Division

John Howe Hall, *Chairman*
J. A. Duma
F. A. Melmoth
C. E. Sims

Malleable Division

J. H. Lansing, *Chairman*
K. H. Hamblin
W. E. Jones
W. A. Kennedy
C. F. Lauenstein
H. A. Schwartz
E. Touceda

Non-Ferrous Division

H. M. St. John, *Chairman*
C. V. Nass
Wm. Romanoff

Patternmaking Division

E. T. Kindt, *Chairman*
E. J. Brady
A. Pyle, Jr.
Vaughan Reid
L. F. Tucker

GENERAL INTEREST COMMITTEES

International Relations Committee

F. G. Steinebach, *Chairman*

Representatives:
European—V. Delport
Australian—Wm. C. Gibson
Brazilian—Dr. Miguel Siegel

Foundry Cost Committee

R. L. Lee, *Chairman* (Representing Gray Iron Founders' Society)
J. D. Burlie (Representing Gray Iron Division)
R. L. Collier (Representing Steel Founders' Society)
C. A. Davis (Representing Gray Iron Division)
V. L. Diefenbacher (Representing Gray Iron Division and Gray Iron Founders' Society)
A. J. Hart (Representing Gray Iron Division)
G. E. Hels (Representing Gray Iron Division)
S. Kitto (Representing Malleable Division and Malleable Founders' Society)
E. J. Metzger (Representing Brass and Bronze Division)
C. S. Roberts (Representing Steel Founders' Society)
E. H. Roeming (Representing Gray Iron Division)
J. A. Wagner (Representing Malleable Division)

Subcommittee on Revision of Recommendations to Buyers of Castings

C. A. Davis, *Chairman*
A. J. Edgar
A. J. Hart
E. J. Metzger
C. S. Roberts
J. A. Wagner

Apprentice Training Committee

J. G. Goldie,* *Chairman*
J. A. Bowers
Frank C. Cech
H. L. Charlson
C. J. Freund
J. E. Goss
John Grennan
F. W. Hunter
J. Morgan Johnson
J. E. Kemp
Donald F. Lane
W. H. Ruten
Wayne Stettbacher
C. W. Wade
A. H. Wornom

Subcommittee on Apprentice Contest

C. W. Wade, *Chairman*
Frank C. Cech
H. L. Charlson
J. Morgan Johnson
G. A. Zabel

Subcommittee on Program and Papers

C. J. Freund, *Chairman*
J. E. Goss
F. W. Hunter
Donald F. Lane
Wayne Stettbacher
C. W. Wade

*Ex-officio member of all Apprentice Training committees.

Subcommittee on Publication on Opportunities in the Foundry

A. H. Wornom, *Chairman*
Frank C. Cech
C. L. Graeber
F. W. Hunter
J. E. Kemp

Subcommittee on Revision of Four-Year Foundry Apprenticeship Standards

J. Morgan Johnson, *Chairman*
John Grennan

Foreman Training Committee

W. G. Conner, Jr., *Chairman*
W. E. George, *Vice Chairman*
G. J. Leroux
T. H. Trevithick
F. E. Wartgow
A. C. Ziebell

Job Evaluation and Time Study Committee

F. E. Wartgow, *Chairman*
W. E. George, *Vice Chairman*
C. E. Rowe, *Secretary*
E. L. Berry
E. J. Metzger
Jeff. Alan Westover
R. G. Wieland

Plant and Plant Equipment Committee

James Thomson, *Chairman*
F. D. Campbell, *Vice Chairman*
E. W. Beach
W. R. Jennings
H. W. Johnson
H. B. Nye

Refractories Committee

J. A. Bowers, *Chairman*
C. E. Bales, *Vice Chairman*
John Lowe, *Secretary*
E. J. Carmody
A. H. Dierker
A. V. Leun

Sand Shop Operation Course Committee

E. E. Woodliff, *Chairman*
F. S. Brewster
P. Charles Fuerst
F. R. Mason
C. P. Randall
F. B. Riggan
D. F. Sawtelle

Foundry Sand Research Committee

Dr. H. Ries,* *Technical Director*
N. F. Hindle,* *Secretary*

Executive Committee

Dr. H. Ries, *Chairman*
N. F. Hindle, *Secretary*
J. B. Caine
H. W. Dietert
N. J. Dunbeck
G. K. Eggleston
W. Finster
J. H. Lansing
C. Mathiesen
C. V. Nass
D. L. Parker
C. P. Randall
W. G. Reichert
C. M. Saeger, Jr.
Stanton Walker
E. C. Zirzow

Subcommittee on Durability

C. E. Schubert, *Chairman*
Jack CoVan
H. W. Dietert
L. Diran
N. J. Dunbeck
G. A. Schumacher
R. Tegman

Subcommittee on Grading and Fineness

(Chairman to be appointed)
H. W. Dietert
N. J. Dunbeck
G. K. Eggleston
C. Mathiesen
W. G. Reichert
H. F. Scobie
E. C. Zirzow

Subcommittee on Flowability

P. E. Kyle, *Chairman*
H. W. Dietert
F. R. Evans
Emile Pragoff, Jr.
D. F. Sawtelle

Subcommittee on Physical Properties of Steel Foundry Sands at Elevated Temperatures

D. L. Parker, *Chairman*
C. W. Briggs
H. W. Dietert
W. Finster
R. A. Gezelius
Howard Mason
Advisors:
H. D. Phillips
J. R. Moynihan
C. P. Randall
J. A. Rassenfoss
W. G. Reichert
D. C. Zuege
W. C. Hamilton

Subcommittee on Sintering Test

J. B. Caine, *Chairman*
H. W. Dietert
K. J. Jacobson
L. B. Osborne
C. M. Saeger, Jr.
H. F. Taylor
R. O. Wertz

Subcommittee on Effect of Sands on the Properties of Castings

H. Womochel, *Chairman*
J. B. Caine
H. W. Dietert
M. H. Gould
O. C. Hoover
F. J. Wurscher
F. L. Wolf

Core Test Subcommittee

E. C. Zirzow, *Chairman*—Malleable
B. M. Weston, *Vice Chairman*—Core Oils
Emile Pragoff, Jr., *Secretary*—Resin Binders
Samuel Appleby—Gray Iron
Wm. Buckholtz—Malleable
H. J. Cole—Steel
E. R. Crosby—Coatings-Washes
H. W. Dietert—Testing
H. E. Donnocker—Sands
M. E. Gantz—Magnesium-Aluminum
H. K. Salzberg—Cereal Binders
F. J. Sedlak—Brass and Bronze
R. D. Walter—Core Oils
E. E. Woodliff—Testing

*Ex-officio member of all Foundry Sand Research committees.

Light Metals Subcommittee

(Chairman to be appointed)
F. S. Brewster
Leo J. T. Brom
David Burton
G. H. Curtis
S. N. Farmer
D. L. Longeuville
H. K. Salzberg

Subcommittee on Nomenclature

Fulton Holtby, *Chairman*
H. W. Dietert
John Grennan

Subcommittee on Papers Review

C. P. Randall
W. G. Reichert
Dr. H. Ries

Committee on Cooperation with Engineering Schools

General Committee

F. G. Sefing, *Chairman*
W. M. Ball, Jr.
H. Bornstein
C. W. Briggs
C. O. Burgess
C. H. Casberg
R. R. Deas, Jr.
A. J. Edgar
C. J. Freund
Robt. Gregg
John Grennan
H. H. Judson
P. E. Kyle
J. H. Lansing
C. H. Lorig
J. T. MacKenzie
Alt.: J. A. Bowers
S. C. Massari
J. F. Oesterle
T. D. Parker
F. F. Shoemaker
F. G. Steinebach
Wayne Stettbacher

Advisory Committee

F. G. Sefing, *Chairman*
C. W. Briggs
A. J. Edgar
C. J. Freund
P. E. Kyle
J. H. Lansing
C. H. Lorig
F. G. Steinebach

Essay Contest Committee

(To be appointed)

Aid to Schools Committee

F. G. Steinebach, *Chairman*

Committee on Fluidity Testing

W. H. Spencer, *Chairman*
C. W. Briggs
C. K. Donoho
G. P. Halliwell
C. F. Joseph
Max Kuniansky
C. M. Saeger, Jr.
H. F. Taylor

Industrial Hygiene Codes Committee

Jas. R. Allan, *General Chairman*
P. R. Mockler (Miss), *Secretary*
C. P. Guion
S. B. Hansen
E. O. Jones
Carl F. Larsson
Nathan Lesser
R. W. McCandlish
S. McMullan
B. A. Parks
John F. Tobin

DIVISION COMMITTEES

Gray Iron Division

F. J. Walls,* *Division Chairman*
C. O. Burgess,* *Division Vice Chairman*
W. E. Mahin,* *Division Secretary*

Advisory Committee

F. J. Walls, *Chairman*
C. O. Burgess, *Vice Chairman*
W. E. Mahin, *Secretary*
A. L. Boegehold
J. W. Bolton
Alt.: M. Milligan
H. Bornstein
E. Bremer
V. A. Crosby
Pat Dwyer
A. J. Edgar
John Erler
H. C. Griggs
W. A. Hambley
R. F. Harrington
Robert Job
Max Kuniansky
C. H. Lorig
J. T. MacKenzie
R. G. McElwee
G. P. Phillips
K. H. Priestley
D. J. Reese
W. H. Rother
C. M. Saeger, Jr.
A. E. Schuh
F. G. Sefing
E. K. Smith
W. H. Spencer
A. P. Spooner
J. S. Vanick
F. K. Vial
E. R. Young

Committee on Program and Papers

F. J. Walls, *Chairman*
R. A. Clark
H. A. Deane
Pat Dwyer
T. E. Eagan
H. C. Griggs
Paul S. Lane
R. G. McElwee
G. P. Phillips

Committee on Shop Operation Course

K. H. Priestley, *Chairman*
P. T. Bancroft
H. H. Wilder

Committee on Analysis of Casting Defects

W. A. Hambley, *Chairman*
E. J. Carmody, *Vice Chairman*
F. W. Hintze, *Secretary*
A. J. Busch
R. K. Glass
A. S. Klopf
John L. Lowe
W. B. McFerrin
C. V. Nass
A. S. Nichols
F. L. Overstreet
F. L. Weaver
W. C. Wine
Charles Zahn

Committee on Pig Iron Qualities

J. T. MacKenzie, *Chairman*
A. L. Boegehold
H. W. Stuart

*Ex-officio member of all Gray Iron Division committees.

Committee on High Temperature Properties of Cast Iron

R. J. Allen, *Chairman*
J. W. Bolton
C. O. Burgess
J. J. Curran
A. J. Edgar
M. V. Healey
J. J. Kanter
John Lowe
W. E. Mahin
R. G. McElwee
G. A. Timmons
J. S. Vanick

Committee on Welding Cast Iron

F. J. Walls, *Chairman*
R. R. Deas, Jr.
M. V. Healey
H. D. Quartz
W. A. Spindler

Committee on Classification of Graphite in Gray Iron—In Cooperation with A.S.T.M. Committee A-3, Subcommittee VII, on Microstructure of Cast Iron

W. E. Mahin, *Chairman*
R. R. Adams
J. W. Bolton
Alt.: A. J. Smith
Alfred Boyles
G. P. Phillips
P. C. Rosenthal

Cupola Research Project Committee

General Committee

D. J. Reese,* *Chairman*
A. L. Boegehold
H. Bornstein
H. Kenneth Briggs
A. E. Caudle
G. S. Evans
A. W. Gregg
T. G. Johnston
Max Kuniansky
John Lowe
J. T. MacKenzie
Alt.: J. A. Bowers
C. K. Donoho
S. C. Massari
Lewis D. McClaren
R. G. McElwee
W. O. McMahon
B. P. Mulcahy
B. C. O'Brien
G. P. Phillips
D. B. Reeder
A. E. Schuh
E. K. Smith
James Thomson
F. J. Walls

Steering Committee

D. J. Reese, *Chairman*
Max Kuniansky
John Lowe
S. C. Massari
R. G. McElwee

Subcommittee on Equipment

J. Thomson, *Chairman*
W. R. Jennings, *Vice Chairman*
A. DeYoung, *Secretary*
M. J. Bradley
A. E. Caudle
A. W. Gregg
W. A. Hambley
John Lowe
J. T. MacKenzie
Alt.: J. A. Bowers
B. A. Miller
B. C. O'Brien
William Pugsley
W. Lee Roueche
L. C. Smith

Subcommittee on Ferrous Materials and Alloys

R. G. McElwee, *Chairman*

Sub-subcommittee on Pig Iron

T. G. Johnston, *Chairman*
B. H. Booth
A. H. Dierker
R. A. Donaldson
H. W. Johnson
T. L. Joseph
M. J. Lefler
R. A. Lindgren
E. C. Mathis
J. E. Reynolds
H. M. Rich

Sub-subcommittee on Scrap

Max Kuniansky, *Chairman*
H. Bornstein
D. H. Meloche
L. W. Pryse
E. K. Smith
H. W. Stuart

Sub-subcommittee on Alloys

R. G. McElwee, *Chairman*
T. E. Barlow
G. F. Comstock
V. A. Crosby
V. H. Schnee
E. K. Smith
F. J. Walls
R. J. Zemanek

Subcommittee on Slags, Fluxes and Desulphurizers

G. S. Evans, *Chairman*
W. Van N. Baker
A. H. Dierker
H. H. Judson
M. J. Lefler
C. H. Lorig
J. T. MacKenzie
Alt.: J. A. Bowers
C. K. Donoho
L. H. Rudesill

Subcommittee on Fuels and Combustion

S. C. Massari, *Chairman*
H. L. Comin
R. W. Lindsay
R. A. Sherman
T. J. Wood
J. T. MacKenzie
Alt.: J. A. Bowers
C. K. Donoho

Subcommittee on Operation and Process

K. Kenneth Briggs, *Chairman*
G. P. Phillips, *Vice Chairman*
E. Bremer
W. H. Brooks
John Grennan
W. A. Hambley
Fulton Holtby
C. F. Joseph
J. J. Kanter
M. J. Lefler
W. Levi
John Lowe
J. T. MacKenzie
Alt.: J. A. Bowers
C. K. Donoho
A. E. Schuh
L. B. Thomas
F. J. Walls
R. E. Wilke

Subcommittee on Finance

Max Kuniansky, *Chairman*

(Membership of committee consists of entire personnel of the General Cupola Research Project Committee)

*Ex-officio member of all Cupola Research Project committees.

Subcommittee on Refractories

J. F. Oesterle, *Chairman*
C. E. Bales
J. A. Bowers
E. J. Carmody
W. D. Chadwick
R. A. Clark
J. O. Everhart
J. A. Kayser
J. T. MacKenzie
Alt.: J. A. Bowers
C. K. Donoho
P. J. May
A. S. Nichols
E. A. Petersen
J. D. Sullivan

Steel Division

C. E. Sims,* *Division Chairman*
R. E. Kennedy,* *Division Secretary*

Advisory Committee

C. E. Sims, *Chairman*
T. N. Armstrong
C. W. Briggs
E. W. Campion
R. A. Gezelius
A. W. Gregg
John Howe Hall
C. H. Lorig
F. A. Melmoth
D. L. Parker
H. D. Phillips
H. M. Rishel
E. K. Smith
A. P. Spooner
L. C. Wilson
S. V. Wood

Committee on Program and Papers

T. N. Armstrong, *Chairman*
H. H. Blosjo
J. W. Bolton
Alt.: M. Milligan
E. Bremer
John Erler
John Howe Hall
G. A. Lillieqvist
A. P. Spooner

Committee on Round Table Conference

(Chairman to be appointed)
John Howe Hall
A. H. Jameson
G. A. Lillieqvist
R. S. Munson
T. D. West

Committee on Methods of Producing Steel for Castings

C. E. Sims, *Chairman*
J. B. Caine
A. W. Gregg
Ernest Lancashire
Chas. Locke
F. A. Melmoth
W. Harvey Payne
H. D. Phillips
W. J. Phillips
E. C. Troy
R. C. Woodward

Committee on Heat Treatment of Steel Castings

(Chairman to be appointed)
H. H. Blosjo
Werner Finster
R. A. Gezelius
C. T. Greenidge
E. R. Young

Committee on Radiography Study of Steel Castings

C. W. Briggs, *Chairman*
J. J. Curran
J. A. Duma
Werner Finster
R. H. Frank
W. C. Hamilton
John W. Juppenlatz
E. W. Page
A. P. Spooner
H. F. Taylor

Committee on Magnetic Powder Testing

R. A. Gezelius, *Chairman*
T. N. Armstrong
J. A. Duma
W. J. Phillips
A. P. Spooner

Malleable Division

A. M. Fulton,† *Division Chairman*
R. E. Kennedy,† *Division Secretary*

Advisory Committee

A. M. Fulton, *Chairman*
C. S. Anderson
C. F. Joseph
J. H. Lansing
H. W. Maack
H. A. Schwartz
E. K. Smith
D. M. Storie
R. J. Teetor
L. J. Wise

Committee on Program and Papers

C. F. Joseph, *Chairman*
R. J. Anderson
D. I. Dobson
L. A. Dunn
A. M. Fulton
W. A. Kennedy
J. H. Lansing
C. C. Lawson
M. E. McKinney
W. D. McMillan
D. F. Sawtelle
P. R. Schilling
G. A. Schumacher
G. B. Stantial
F. L. Wolf

Committee on Round Table Conference

J. H. Lansing, *Chairman*
A. M. Fulton
K. H. Hamblin

Committee on Specifications

H. A. Schwartz, *Chairman*

Brass and Bronze Division

Wm. Romanoff,** *Division Chairman*
C. V. Nass,** *Division Vice Chairman*
N. F. Hindle,** *Division Secretary*

Advisory Committee

Wm. Romanoff, *Chairman*
C. V. Nass, *Vice Chairman*
Wm. J. Laird, *Past Chairman*
N. F. Hindle, *Secretary*
G. K. Dreher
E. F. Hess
R. J. Keeley
J. W. Kelin
E. J. Metzger
C. O. Thieme (Chairman, Program and Papers Committee)
D. Frank O'Connor (Chairman, Recommended Practices Committee)
B. A. Miller (Chairman, Round Table Conference Committee)

Committee on Program and Papers

C. O. Thieme, *Chairman*
W. B. George
M. V. Healey
R. J. Keeley
J. W. Kelin

Committee on Round Table Conference

B. A. Miller, *Chairman*
W. M. Ball, Jr.
C. O. Thieme
Howard Waldron

Recommended Practices Committee

D. Frank O'Connor, *Chairman*
E. F. Hess, *Vice Chairman*
S. A. Wiegand, *Secretary*
M. E. Brooks
Earl Bush
W. W. Edens
W. B. George
A. K. Higgins
E. G. Jennings
J. F. Lammering
Leighton M. Long
H. M. St. John

Subcommittee on Red Brass

G. K. Eggleston, *Chairman*
R. W. Parsons

Subcommittee on Tin Bronze

E. F. Hess, *Chairman*
John W. Bolton

Subcommittee on Nickel Alloys

(Chairman to be appointed)
C. A. Crawford
J. E. Crown
E. W. Horlebein

Subcommittee on Silicon Bronzes

E. G. Jennings, *Chairman*
Wm. B. Goudielock
R. J. Keeley
R. V. Peters
A. E. St. John
R. E. Vinning
L. A. Ward
V. P. Weaver

Subcommittee on Aluminum Bronze

A. K. Higgins, *Chairman*
W. W. Edens

Subcommittee on Manganese Bronze

S. W. Chappell
Wm. B. George
B. A. Miller

Research Committee

G. P. Halliwell
N. A. Ziegler

Aluminum and Magnesium Division

N. E. Woldman,* *Division Chairman*
R. E. Kennedy,* *Division Secretary*

Advisory Committee

N. E. Woldman, *Chairman*
L. Brown
B. D. Claffey
H. J. Deutsch
C. C. Hitchcock
H. G. Lamker
W. E. Martin
J. B. Neiman
H. J. Rowe
A. T. Ruppe
G. H. Starmann
A. W. Stolzenburg

Committee on Aluminum Alloys Recommended Practices

H. J. Rowe, *Chairman*
(Committee to be appointed)

Committee on Magnesium Alloys Recommended Practices

M. E. Brooks, *Chairman*
(Committee to be appointed)

Patternmaking Division

Vaughan Reid,† *Division Chairman*
Frank C. Cech,† *Division Vice Chairman*
R. E. Kennedy,† *Division Secretary*

Advisory Committee

Vaughan Reid, *Chairman*
Frank C. Cech, *Vice Chairman*
D. G. Anderson
E. J. Brady
E. T. Kindt
J. A. Leisk
A. Pyle, Jr.
V. J. Sedlon

Committee on Program and Papers

Frank C. Cech, *Chairman*
V. J. Sedlon

Committee on Revision of Pattern Color Standards

(Chairman to be appointed)
J. A. Leisk
A. Pyle, Jr.

A.F.A. REPRESENTATIVES

On Other Society Committees and Cooperative Projects

Representative on Alloys of Iron Research—Engineering Foundation
J. T. MacKenzie

*Ex-officio member of all Steel Division committees.
†Ex-officio member of all Malleable Division committees.
**Ex-officio member of all Brass and Bronze Division committees.

*Ex-officio member of all Aluminum and Magnesium Division committees.
†Ex-officio member of all Patternmaking Division committees.

Representatives on Joint Committee on Foundry Refractories

Jas R. Allan — J. A. Kayser
E. J. Carmody — R. E. Kennedy

Representative on Committee on Classification of Iron and Steel Scrap, R58-36, Division of Simplified Practice, National Bureau of Standards

H. W. Stuart

Representatives on Ferrous Metals, Advisory to National Bureau of Standards

H. Bornstein — J. T. MacKenzie

Representative on National Bureau of Standards, Advisory Committee, Non-Ferrous Metals

Sam Tour

Representative on Research Committee, National Industrial Sand Association

Dr. H. Ries

Representatives on Committees of the American Society for Testing Materials

A-1, on Steel
C. E. Sims

A-3, on Cast Iron
F. J. Walls — W. E. Mahin
D. P. Hopkins — R. E. Kennedy

Subcommittee I, on Pig Iron
D. P. Hopkins — *Alt.:* H. W. Stuart

Subcommittee VII, on Microstructure of Cast Iron
W. E. Mahin

A-7, on Malleable Iron Castings
H. A. Schwartz

B-2, Committee on Non-Ferrous Metals and Alloys
G. H. Clamer — F. L. Wolf

Subcommittee I, on Pure Metals in Ingot Form
G. H. Clamer

Subcommittee VI, on Coated Metals
F. L. Wolf

B-5, on Copper Base Alloys
F. L. Wolf — N. F. Hindle

C-8, on Refractories
John L. Lowe

D-5, on Coal and Coke
J. T. MacKenzie

E-1, on Methods of Testing
L. C. Wilson

E-7, on Radiography
C. W. Briggs — John Howe Hall

B-7, on Light Metals and Alloys
N. E. Woldman

Subcommittee I, Aluminum and Aluminum Alloy Ingots
A. Sugar

Subcommittee II, Aluminum Alloy Castings
A. Sugar

Subcommittee IV, Magnesium and Magnesium Alloys, Cast and Wrought
M. E. Brooks

American Coordinating Committee on Corrosion
J. T. MacKenzie — *Alt.:* A. E. Schuh

Committee on Heat Treating Definitions
H. Bornstein — J. S. Vanick

Representatives on Committees of the American Standards Assn.

Project A-21, Specifications for Cast Iron Pipe and Special Castings
H. W. Stuart

Project A-35, Manhole Frames and Covers
C. J. P. Hoehn — E. B. Smith — R. E. Moore

Project B-19, Safety Code for Compressed Air Machinery
J. M. Dolan

Project B-20, Safety Code for Conveyors and Conveying Machinery
S. B. Hansen

Project B-30, Safety Code for Cranes, Derricks and Hoists
A. H. McDougall

Project Z-9, Safety Code for Exhaust Systems
Jas. R. Allan — O. E. Mount

Project H-13 (1925), Sectional Committee on Outside Dimensions of Plumbago Crucibles for Non-Tilting Furnaces in Non-Ferrous Foundry Practice
N. K. B. Patch

Project Z-14, Standards for Drawing and Drafting Room Practice
E. F. Cone

Project Z-23, Specifications for Sieves for Testing Purposes
Dr. H. Ries

Classification and Designation of Surface Qualities
E. F. Cone

Mechanical Standards
L. M. Sherwin

Representative on A.I.M.E. Open-Hearth Committee

C. E. Sims

Addresses of Committee Personnel

Adams, R. R., Asst. Supv., Battelle Memorial Institute, 505 King Ave., Columbus, O.
Allan, Jas. R., Asst. Mgr., Industrial Engineering & Construction Div., International Harvester Co., 180 N. Michigan Ave., Chicago.
Allen, R. J., Met. Engr., Worthington Pump & Machinery Corp., Harrison, N. J.
Anderson, C. S., Pres., Belle City Malleable Iron Co., Racine, Wis.
Anderson, D. G., Fdry. Engr., 107 S. Prospect, Clarendon Hills, Ill.
Anderson, R. J., Gen. Supt., Belle City Malleable Iron Co., Racine, Wis.
Anthes, L. L., Managing Director, Anthes Foundry Co., 30 Jefferson Ave., Toronto, Ont., Canada.
Appleby, Samuel, Fdry. Supt., Buffalo Foundry & Machine Co., Buffalo, N. Y.
Armstrong, T. N., Met., International Nickel Co., 67 Wall St., New York, N. Y.
Aufderhaar, H. C., Met., Electro Metallurgical Co., 230 N. Michigan Ave., Chicago, Ill.
Austin, H. S., Fdy.Met., Buick Motor Co., 3507 Sunset, Flint, Mich.
Avey, D. M., Avey Products Co., P. O. Box 1914, Tulsa, Okla.

Baker, W. Van N., Met., Standard Foundry Co., 25 Southgate St., Worcester, Mass.
Bales, C. E., Vice Pres., Ironton Fire Brick Co., Ironton, O.
Ball, W. M., Jr., Supt., Edna Brass Mfg. Co., 528 Reading Rd., Cincinnati, O.
Ballard, E. H., Gen. Fdry. & Patt. Shop Supt., General Electric Co., 920 Western Ave., West Lynn, Mass.
Bancroft, J. C., Met. Engr., Perfect Circle Co., R. No. 3, New Castle, Ind.
Bancroft, P. T., Salesman, Republic Coal & Coke Co., 2411—23rd Ave. B, Moline, Ill.
Barlow, T. E., Fdry. Engr., Vanadium Corp. of America, 2440 Book Tower, Detroit, Mich.
Beach, E. W., Engrg. Exec., Campbell Wyant & Cannon Foundry Co., Muskegon, Mich.
Bean, W. R., Vice Pres., Whiting Corp., Harvey, Ill.; present address, Chief, Foundry Equipment and Supplies Unit, Tools Section, Room 4520, Social Security Bldg., Washington, D. C.
Berry, E. L., Vice Pres., Link-Belt Ordnance Co., 306 W. 37th St., Chicago, Ill.
Blosjo, H. H., Met., Minneapolis Electric Steel Castings Co., 3800 N. E. 5th St., Minneapolis, Minn.
Boardman, N. Harold, Gen. Mgr., Elmira Foundry Co., 1226 W. Water St., Elmira, N. Y.
Boegehold, A. L., Head, Met. Dept., General Motors Research Labs., 485 W. Milwaukee, Detroit, Mich.
Bolton, J. W., Met., The Lunkenheimer Co., Beekman and Waverly Aves., Cincinnati, O.
Booth, B. H., Met., Jackson Iron & Steel Co., Jackson, O.
Bornstein, H., Dir., Testing & Res. Labs., Deere & Co., Moline, Ill.
Bowers, J. A., Melting Supt., American Cast Iron Pipe Co., Birmingham, Ala.
Boyles, Alfred, Met., U. S. Pipe & Foundry Co., Burlington, N. J.
Bradley, M. J., Market Extension Engr., Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Brady, E. J., Alloy Rods Co., York, Pa.
Bremer, E., Met. Editor, *The Foundry*, Penton Bldg., Cleveland, O.
Brewster, F. S., Met., Dowmetal Foundry, Dow Chemical Co., Bay City, Mich.
Briggs, C. W., Tech. Adv., Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Briggs, H. Kenneth, Sales Met., Miller & Co., 332 S. Michigan Ave., Chicago, Ill.
Brom, L. J. T., Met. Dept., Aluminum Co. of America, 2210 Harvard Ave., Cleveland, O.
Brooks, M. E., Met., Dowmetal Foundry, Dow Chemical Co., Bay City, Mich.
Brooks, W. H., Gen. Foreman, Allis Chalmers Mfg. Co., 1446 N. 40th, Milwaukee, Wis.
Brown, L., Plt. Mgr., Magnesium Fabricators Div., Bohn Aluminum & Brass Corp., E. Maumee St., Adrian, Mich.
Buckholtz, Wm., Supt., Belle City Malleable Iron Co., Racine, Wis.
Bureau of Ships, Navy Dept., Washington, D. C.
Burgess, C. O., Met., Engr., Union Carbide & Carbon Research Labs., Inc., 4625 Royal Ave., Niagara Falls, N. Y.
Burlie, J. D., Engr., Sheet Metal, Fdry. and Woodwork, Western Electric Co., Dept. 7724, Hawthorne Sta., Chicago, Ill.
Burton, David, Aluminum Co. of America, 3311 Dunn Rd., Detroit.
Busch, A. J., Fdry. Engr., C. C. Kawin Co., 431 S. Dearborn St., Chicago, Ill.
Bush, Earl, Foreman Molder, Naval Gun Factory, Washington, D. C.

Caine, J. B., Met., Sawbrook Steel Castings Co., Lockland, Cincinnati, O.
Campbell, F. D., Fdry. Production Consulting Engr., 8951 Lowe Ave., Chicago, Ill.
Campion, E. W., Pres., Bonney Floyd Co., 611 Marion Rd., Columbus, O.

Cannon, G. W., Vice Pres., Campbell, Wyant & Cannon Foundry Co., 1201 Sanford St., Muskegon Heights, Mich.
Carmody, E. J., Met., C. C. Kawin Co., 431 S. Dearborn St., Chicago, Ill.
Casberg, C. H., Prof., Mech. Engrg., University of Illinois, Urbana, Ill.
Caudle, A. E., Sales Engr., Blower and Compressor Dept., Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Cech, Frank C., Pattern Instr., Cleveland Trade School, 535 Eagle Ave., Cleveland, O.
Chadwick, W. D., Mgr., Novelty Foundry & Iron Works, Wallace St., Sterling, Ill.
Chappell, S. W., Electric Boat Co., Groton, Conn.
Charlson, H. L., Asst. Wks. Mgr., American Steel Foundries, East Chicago, Ind.
Claffey, B. D., Mgr., Gray Iron and Aluminum Div., General Malleable Corp., Waukesha, Wis.
Clamer, G. H., Pres., Ajax Metal Co., 46 Richmond St., Philadelphia.
Clark, R. A., Met., Lakey Foundry & Machine Co., Muskegon, Mich.
Coffman, J. G., Plant Mgr., Los Angeles Steel Casting Co., 2444 S. Alameda St., Los Angeles, Calif.
Cole, H. J., Chemist, General Electric Co., Schnectady, N. Y.
Collier, R. L., Secy., Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Comin, H. L., Gen. Mgr., Indiana Gas & Chemical Corp., 13th & Hulman, Box 268, Terre Haute, Ind.
Comstock, G. F., Met., Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
Cone, E. F., Editor, *Metals & Alloys*, 330 W. 42nd St., New York, New York.
Conner, W. G., Jr., Supt. of Fdries., Walworth Co., Greensburg, Pa.
CoVan, Jack, Instructor in Mechanical Engineering, University of Illinois, Urbana, Ill.
Crawford, C. A., Development & Research Div., International Nickel Co., Inc., 67 Wall St., New York, N. Y.
Crosby, E. R., Engr., Smith Facing & Supply Co., 1857 Carter Rd., Cleveland, O.
Crosby, V. A., Met. Engr., Climax Molybdenum Co., Detroit. (Mailing address: 1715 Cedar Hill Rd., Royal Oak, Mich.)
Crown, J. E., Master Mechanic, U. S. Naval Gun Factory, Washington, D. C.
Curran, J. J., Res. Met., Walworth Co., Greensburg, Pa.
Curtis, G. H., Met. Dept., Dodge Chicago Plant, Chrysler Corp., 7401 S. Cicero Ave., Chicago, Ill.

Davis, C. A., Purchasing Dept. Engr., Caterpillar Tractor Co., Peoria, Ill.
Day, W. E., Jr., Met., Mack Mfg. Co., Jersey Ave., New Brunswick, N. J.
Deane, H. A., Asst. Wks. Mgr., American Brake Shoe & Foundry Co., Brake Shoe & Castings Div., 230 Park Ave., New York, N. Y.
Deas, R. R., Jr., Asst. to Vice Pres., American Cast Iron Pipe Co., Birmingham, Ala.
Delport, V., Penton Publishing Co., Ltd., 2 Caxton St., Westminster, London, S. W. 1, England.
Denison, A. C., Pres., Fulton Foundry & Machine Co., E. 75th St. & Morgan Ave., Cleveland, O.
Deutsch, H. J., Mgr., American Magnesium Corp., 1880 Elmwood Ave., Buffalo, N. Y.
DeYoung, A., Adv. Mgr., Whiting Corp., Harvey, Ill.
Diefenbacher, V. L., Cost Supv., The Hamilton Foundry & Machine Co., 1551 Lincoln Ave., Hamilton, O.
Dierker, A. H., Res. Engr., Engineering Experiment Sta., Ohio State University, Columbus, O.
Dietert, H. W., Pres., Harry W. Dietert Co., 9330 Roselawn Ave., Detroit, Mich.
Diran, Loris, Lebanon Steel Foundry, Lebanon, Pa.
Dobson, D. I., Met., General Malleable Corp., Waukesha, Wis.
Dolan, J. M., Compressor Engineering Div., Sullivan Machinery Co., Michigan City, Ind.
Donaldson, R. A., Met., Woodward Iron Co., Woodward, Ala.
Donnocker, H. E., Field Engr., Ottawa Silica Co., Ottawa, Ill.
Donoho, C. K., Met., American Cast Iron Pipe Co., Birmingham, Ala.
Draffin, J. O., Prof., Theoretical and Applied Mechanics Dept., University of Illinois, 218 Talbot Lab., Urbana, Ill.
Dreher, G. K., Plant Mgr., Ampco Metal, Inc., 1745 S. 38th St., Milwaukee, Wis.
Duma, J. A., Met., Norfolk Navy Yard, Portsmouth, Va.
Dunbeck, N. J., Vice Pres., Eastern Clay Products Co., Eifort, O.
Dunn, L. A., Supt. Fdries., General Electric Co., Erie, Pa.
Dwyer, Pat., Engineering Editor, *The Foundry*, Penton Bldg., Cleveland, O.

Eagan, T. E., Chief Met., Cooper-Bessemer Corp., Grove City, Pa.
Eash, J. T., Res. Met., International Nickel Co., 30 Oak St., Bayonne, N. J.
Eddy, W. P., Jr., Met. & Service Engr., General Motors Truck & Coach Div., Yellow Truck & Coach Mfg. Co., South Blvd., Pontiac, Mich.
Edens, W. W., Met., Ampco Metal, Inc., 1745 So. 38th St., Milwaukee, Wis.
Edgar, A. J., Tech. Adv., Gray Iron Founders' Society, 1719 "K" St., Washington, D. C.
Eggleston, G. K., Chief Engr., Barnes Mfg. Co., Mansfield, O.
Erler, John, Met., Farrel-Birmingham Co., Ansonia, Conn.
Evans, F. R., Fdry. Instr., Massachusetts Institute of Technology, Room 35-262, Cambridge, Mass.
Evans, G. S., Met., Mathieson Alkali Works, 60 E. 42nd St., New York, N. Y.
Everhart, J. O., Asst. to Gen. Supt., Kentucky Fire Brick Co., Haldeman, Ky

Farmer, S. N., Vice Pres., Sand Products Corp., National Bank Bldg., Cleveland, O.
Finster, Werner, Met., Reading Steel Casting Div., American Chain & Cable Co., Reading, Pa.
Forbes, D. P., Pres., Gunite Foundries Corp., Rockford, Ill.
Frank, R. H., Chief Met., Bonney-Floyd Co., Columbus, O.
Freund, C. J., Dean, College of Engineering, University of Detroit, Detroit, Mich.
Fuerst, P. Charles, Falk Corp., Milwaukee, Wis.
Fuller, B. D., Whitehead Bros. Co., 1228 Edward St., Lakewood, O.
Fulton, A. M., Supt., Northern Malleable Iron Co., 867 Forest St., St. Paul, Minn.

Galloway, C, D., III, Fdry. Supt., Chambersburg Engineering Co., Chambersburg, Pa.
Gantz, M. E., Met., American Magnesium Corp., 2210 Harvard Ave., Cleveland, O.
Gellert, J. H., Supt., Nichol-Straight Foundry Co., 3174 S. Archer Ave., Chicago, Ill.
George, W. B., Met. & Fdry. Engr., R. Lavin & Sons, Inc., 3426 S. Kedzie Ave., Chicago, Ill.
George, W. E., Asst. to the Management, Campbell Wyant & Cannon Foundry Co., Muskegon, Mich.
Gezelius, R. A., Met., Engr., General Steel Castings Corp., Eddystone, Pa.
Gibson, Wm. C., 29-33 Wilson St., Redfern, Sydney, Australia.
Glass, R. K., Met., Republic Steel Corp., S. Park Ave., Buffalo, New York.
Goldie, J. G., Fdry. Instr., Cleveland Trade School, 535 Eagle Ave., Cleveland, O.
Goss, J. E., Apprentice Supv., Brown & Sharpe Mfg. Co., Providence, R. I.
Goudielock, Wm. B., Met., Phelps Dodge Copper Products Corp., 40 Wall St., New York, N. Y.
Goudy, O. E., Fdry. Supt., Kelsey-Hayes Wheel Co., 3600 Military Ave., Detroit, Mich.
Gould, M. H., Member, Technical Staff, Aluminum Co. of America, 2210 Harvard Ave., Cleveland, O.
Graeber, C. L., Apprentice Coordinator, Milwaukee Vocation School, 1015 N. 6th St., Milwaukee, Wis.
Greenidge, C. T., Met., Battelle Memorial Institute, 505 King Ave., Columbus, O.
Gregg, A. W., Exec. Engr., Foundry Equipment Div., Whiting Corp., Harvey, Ill.
Gregg, Robt., Fdry. Supt., Reliance Regulator Corp., 1000 Meridian St., Alhambra, Calif.
Gregory, M. J., Factory Mgr., Caterpillar Tractor Co., Peoria, Ill.
Grennan, John, Instr., Dept. of Metal Processing, University of Michigan, Ann Arbor, Mich.
Griggs, H. C., Chief Met., Waterbury-Farrel Foundry & Machine Co., 453 Bank, Waterbury, Conn.
Guion, C. P., Distr. Mgr., W. W. Sly Mfg. Co., 1661 N. Milwaukee Ave., Chicago, Ill.

Hageboeck, A. E., Pres., Frank Foundries Corp., 2020 3rd Ave., Moline, Ill.
Hall, John Howe, 611 Strath Haven Ave., Swarthmore, Pa.
Halliwell, G. P., Dir. of Res., H. Kramer & Co., 2119 S. Loomis St., Chicago, Ill.
Hambley, W. A., Fdry. Met., Allis-Chalmers Mfg. Co., Milwaukee, (Mailing address: 1170 N. 43rd St., Milwaukee, Wis.)
Hamblin, K. H., Forgings & Castings Unit, Products Section, WPB, Temporary Bldg. R, Room 2545, Washington, D. C.
Hamilton, W. C., Res. Dir., American Steel Foundries, East Chicago, Ind.
Hammond, T. S., Chief, Chicago Ordnance District, 39 S. La Salle St., Chicago, Ill.
Hansen, S. B., Dust Res. Eng., International Harvester Co., 180 N. Michigan Ave., Chicago, Ill.
Hardy, Chas., Pres., Hardy Metallurgical Co., 420 Lexington Ave., New York, N. Y.
Harrington, R. F., Fdry. Supt. & Chief Met., Hunt-Spiller Mfg. Corp., 383 Dorchester Ave., Boston, Mass.
Hart, A. J., Fdry. Div. Mgr., R. Hoe & Co., Inc., Dunellen, N. J.
Healey, M. V., Casting Met., General Electric Co., 1 River Rd., Schenectady, N. Y.
Hels, G. E., Prod. Mgr., Vilter Mfg. Co., 2217 S. First St., Milwaukee, Wis.
Hess, E. F., Met. Engr., Ohio Injector Co., Wadsworth, O.
Higgins, A. K., Met., Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hindle, N. F., Asst. Secy., American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.
Hintze, F. W., Salesman, Illinois Clay Products Co., 608 S. Dearborn St., Chicago, Ill.
Hitchcock, C. C., Partner and Supt., R. C. Hitchcock & Sons, 3023 Snelling Ave., Minneapolis, Minn.
Hoehn, C. J. P., Pres., Enterprise Foundry Co., 2902—19th St., San Francisco, Calif.
Holtby, Fulton, Asst. Prof., University of Minnesota, Mechanical Engineering Bldg., Minneapolis, Minn.
Hoover, O. C., Supt., Acme Foundry Co., 2503—22nd St., Detroit, Mich.
Hopkins, D. P., Vice Pres., U. S. Pipe & Foundry Co., Burlington, New Jersey.
Horlebein, E. W., Pres., Gibson & Kirk Co., Warner & Bayard Sts., Baltimore, Md.
Hoyt, C. E., Convention and Exhibits Manager, American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.
Hunter, F. W., Fdry. Supt., Sargent & Co., New Haven, Conn. (Mailing address: 40 Elm, East Haven, Conn.)

Jackson, J. E., 713 Dartmouth, Silver Spring, Md.
Jacobson, K. J., Asst. Chief Chem., Griffin Wheel Co., 445 N. Sacramento Blvd., Chicago, Ill.
Jameson, A. H., Mgr. of Casting Sales, Malleable Iron Fittings Co., Branford, Conn.
Jennings, E. G., Met., McKay Smelters, Lt., 25 McKay St., Ottawa, Ont., Canada.
Jennings, W. R., Fdry. Supt., John Deere Tractor Co., Waterloo, Ia.
Job, Robert, Vice Pres., Milton Hersey Co., Ltd., 980 St. Antoine St., Montreal, Que., Canada.
Johnson, H. W., Supt., Northwestern Foundry Co., 662 W. Roosevelt Rd., Chicago, Ill.
Johnson, J. Morgan, Vocational Supv., Tri-City Manufacturers' Association, Box 148, Moline, Ill.
Johnston, T. G., Met. Engr., Pig Iron Div., Republic Steel Corp., Republic Bldg., Cleveland, O.
Jominy, W. E., Chief Met., Dodge-Chicago Plant, Chrysler Corp., 7401 S. Cicero Ave., Chicago, Ill.
Jones, E. O., Personnel Dir., Belle City Malleable Iron Co., Racine, Wis.
Jones, W. E., Met., Stockham Pipe Fittings Co., Birmingham, Ala.
Joseph, C. F., Met., Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.
Joseph, T. L., Head, Dept. of Met., University of Minnesota, Minneapolis, Minn.
Judson, H. H., Fdry. Supt., Goulds Pumps, Inc., 238 Fall St., Seneca Falls, N. Y.
Juppenlatz, J. W., Chief Met., Lebanon Steel Foundry, Lebanon, Pa.

Kanter, J. J., Res. Met., Crane Co., 4100 S. Kedzie Ave., Chicago, Ill.
Kayser, J. A., Chief Refractories Engr., Laclede-Christy Clay Products Co., 1711 Ambassador Bldg., St. Louis, Mo.
Keeley, R. J., Chief Met., Ajax Metal, Inc., 46 Richmond St., Philadelphia, Pa.
Kelin, J. W., Asst. Sales Mgr., Federated Metals Div., American Smelting & Refining Co., 4041 Park Ave., St. Louis, Mo.
Kemp, J. E., Supv. of Training, Walworth Co., 3rd & Elm Sts., Kewanee, Ill.
Kennedy, R. E., Secretary, American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.
Kennedy, W. A., Supv. of Products, Grinnell Co., Inc., 260 W. Exchange St., Providence, R. I.
Kerlin, W. W., Repr., Meehanite Metal Corp., 311 Ross St., Pittsburgh, Pa.
Kindt, E. T., Pres., Kindt-Collins Co., 12697 Elmwood Ave., Cleveland, O.
Kitto, S., Treas., Belle City Malleable Iron Co., Racine, Wis.
Klopf, A. S., Vice Pres. & Mgr., Hansell-Elcock Co., 3153 S. California Ave., Chicago, Ill.
Kuniansky, Max, Gen. Mgr., Lynchburg Foundry Co., Lynchburg, Va.
Kyle, P. E., Asst. Prof., Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, Mass.

Laird, Wm. J., Met., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Lamker, H. G., Supt. of Fdries., Wright Aeronautical Corp., Paterson, N. J.
Lammering, J. F., Vice Pres., Hammond Brass Co., Summer St., Hammond, Ind.
Lanahan, F. J., Pres., Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
Lancashire, Ernest, Chief Chem., Detroit Steel Casting Co., 4069 Michigan St., Detroit, Mich.
Lane, D. F., Dir. of Training, Bethlehem Steel Co., Maryland Plant, Sparrows Point, Md.
Lane, P. S., Met., Muskegon Piston Ring Co., Sixth & Alpha, Muskegon, Mich.
Lansing, J. H., Shop Practice Engr., Malleable Founders' Society, Union Commerce Bldg., Cleveland, O.
Larsson, C. F., Air Filter & Equipment Co., 228 N. La Salle St., Chicago, Ill.
Lauenstein, C. F., Chief Met., Link Belt Co., Indianapolis, Ind.
Lawson, C. C., Supt., Wagner Malleable Iron Co., Decatur, Ill.
Lee, R. L., Comptroller, Grede Foundries, Inc., 6432 W. State St., Milwaukee, Wis.
Lefler, M. J., Works Mgr., Western Foundry Co., 3634 S. Kedzie Ave., Chicago, Ill.
Leisk, J. A., Gen. Supt., Fdries. & Patt. Shops, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Leroux, G. J., Asst. Mgr., National Malleable & Steel Casting Co., 10600 Quincy Ave., Cleveland, O.
Lesser, Nathan, Deere & Co., Moline, Ill.
Leun, A. V., Refractories Engr., Bethlehem Steel Co., Bethlehem, Pa.
Levi, W., Met., Lynchburg Foundry Co., Radford, Va.
Lillieqvist, G. A., Chief Met., American Steel Foundries, East Chicago, Ind.
Lindgren, R. A., Supt., Blast Furnaces, Wisconsin Steel Works, 2701 E. 106th St., South Chicago, Ill.
Lindsay, R. W., Res. Asst., Association of Manufacturers of Chilled Car Wheels, 445 N. Sacramento Blvd., Chicago, Ill.
Locke, Charles, Met., West Michigan Steel Foundry Co., Muskegon, Mich.
Long, Leighton M., Met. & Fdry. Supt., Bunting Brass and Bronze Co., 715 Spencer Ave., Toledo, O.
Longeuville, D. L., Fdry. Lab. Supt., Wright Aeronautical Corp., Cincinnati, O.
Lorig, C. H., Met., Battelle Memorial Institute, 505 King Ave., Columbus, O.
Lottier, L. F., Asst. Met., Peoples Gas, Light & Coke Co., 122 S. Michigan Ave., Chicago, Ill.
Lowe, John, Battelle Memorial Institute, 505 King Ave., Columbus, O.

Maack, H. W., Chief Chem. & Met., Crane Co., 4100 S. Kedzie Ave., Chicago, Ill.
MacKenzie, J. T., Chief Met., American Cast Iron Pipe Co., 2930 N. 16th St., Birmingham, Ala.
Mahin, W. E., Engr., Feeder Engrg. Dept., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Martin, W. E., Met., Sperry Gyroscope Co., Inc., 158-11 72nd Ave., Flushing, N. Y.
Mason, F. R., Asst. Plant Mgr., Riley Stoker Corp., Foot of Walker St., Detroit, Mich.
Mason, Howard, Prod. Mgr., Symington-Gould Corp., 1 Main St., Depew, N. Y.
Massari, S. C., 1443 Franklin Ave., River Forest, Ill.
Mathieson, C., Prod. Mgr., Whitehead Bros. Co., Box 864, Albany, New York.
Mathis, E. C., Met., Pickands Mather & Co., 332 S. Michigan Ave., Chicago, Ill.
May, P. J., Service Engr., Cleveland Quarries Co., 1125 Builders Exchange, Cleveland, O.
McCandlish, R. W., Research Corp., 59 E. Van Buren St., Chicago, Ill.
McCarroll, R. H., Chief Chem. & Met., Ford Motor Co., Dearborn, Mich.
McClaren, Lewis D., Mgr., By-Prod. Coke Dept., Republic Coal & Coke Co., 8 S. Michigan Ave., Chicago, Ill.
McDougall, A. H., Vice Pres., Whiting Corp., Harvey, Ill.
McElwee, R. G., Mgr., Fdry. Alloy Div., Vanadium Corp. of America, 2440 Book Bldg., Detroit, Mich
McFadden, W. H., 16th Floor, Trinity Life Bldg., Fort Worth, Tex.
McFerrin, W. B., Fdry. Met., Cadillac Motor Car Co., 2860 Clark Ave., Detroit, Mich.
McGrail, C. R., Mgr., Nickel Dept., Steel Sales Corp., 3348 S. Pulaski Rd., Chicago, Ill.
McKinney, M. E., Met., International Harvester Co. of Canada, Ltd., 30 Gladstone Ave., Hamilton, Ont., Canada.
McMahon, W. O., Chief Fdry. Met., Sloss-Sheffield Steel & Iron Co., 3131—1st Ave., N., Birmingham, Ala.
McMillan, W. D., Met., International Harvester Co., McCormick Wks., Blue Island & Western Ave., Chicago, Ill.
McMullen, S., Western Electric Co., Cicero, Ill.

Melmoth, F. A., Vice Pres., Detroit Steel Casting Co., 4069 Michigan St., Detroit, Mich.
Meloche, D. H., Mgr., Met. & Chem. Lab., Inst. of Thermal Research, American Radiator and Standard Sanitary Corp., 675 Bronx River Rd., Yonkers, N. Y.
Metzger, E. J., Gen. Supt., Falcon Bronze Co., 218 S. Phelps St., Youngstown, O.
Meyer, H. W., Sand Research Dept., General Steel Castings Corp., Granite City, Ill.
Miles, H. D., Pres., Buffalo Foundry & Machine Co., Buffalo, N. Y.
Miller, B. A., Chief Met., Baldwin Locomotive Works, Camp Brass & Iron Foundries Div., Paschall Sta., Philadelphia, Pa.
Milligan, M., Met., The Lukenheimer Co., Beekman and Waverly Aves., Cincinnati, O.
Mockler, P. R. (Miss), American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.
Moore, R. E., Vice Pres. & Treas., Flockhart Foundry Co., 83 Polk St., Newark, N. J.
Morken, C. H., Supt. of Operations, Carondelet Foundry Co., 2101 S. Kingshighway, St. Louis, Mo.
Mount, O. E., Treas., American Steel Foundries, 410 N. Michigan Ave., Chicago, Ill.
Moynihan, Prof. J. R., Head, Materials Testing Laboratories, Cornell University, Ithaca, N. Y.
Mulcahy, B. P., Res. Engr., Citizens' Gas & Coke Utility, 49 S. Pennsylvania St., Indianapolis, Ind.
Munson, R. S., Vice Pres., Atlantic Steel Castings Co., 6th and Lloyd Sts., Chester, Pa.
Myers, Harold, Met., Sealed Power Corp., Sanford & Keating Sts., Muskegon, Mich.

Nass, C. V., Asst. Supt. of Fdries, Fairbanks, Morse & Co., Beloit, Wis.
Neiman, J. B., Mgr., Federated Metals Corp., 11630 Russell St., Detroit, Mich.
Nichols, A. S., Vice Pres., Illinois Clay Products Co., 608 S. Dearborn St., Chicago, Ill.
Nye, Howard B., Fdry. Engr., New York Air Brake Co., Watertown, N. Y.

O'Brien, B. C., Vice Pres., Roots-Connersville Blower Co., Connersville, Ind.
O'Connor, D. Frank, Works Mgr., Watts Regulator Co., 10 Embankment St., Lawrence, Mass.
Oesterle, J. F., Prof. Met. Engrg., University of Wisconsin, Madison, Wis.
Olson, L. W., Ohio Brass Co., Mansfield, Ohio.
Osborn, L. B., Sales Mgr., Hougland & Hardy, Inc., Evansville, Ind.
Overstreet, F. L., Illinois Clay Products Co., Chicago. (Mailing address: 837 Virginia St., Gary, Ind.)

Page, E. W., Mgr., General Electric X-Ray Corp., 2012 W. Jackson Blvd., Chicago, Ill.
Parker, D. L., Fdry. Supt., General Electric Co., 69 Norman St., Everett, Mass.
Parker, T. D., Climax Molybdenum Co., 500—5th Ave., New York, New York.
Parks, B. A., Plant Engr., Crane Co., 4100 S. Kedzie Ave., Chicago, Ill.
Parsons, R. W., Met., Ohio Brass Co., Mansfield, O.
Patch, N. K. B., Secy., Lumen Bearing Co., 197 Lathrop St., Buffalo, N. Y.
Payne, W. Harvey, Pres. & Gen. Mgr., Hydro-Arc Furnace Corp., 9 S. Clinton St., Chicago, Ill.
Peters, R. V., Supt., Bridgeport Brass Co., Bridgeport, Conn.
Petersen, E. A., Fdry. Mgr., Chrysler Corp., 7900 Jos. Campau Ave., Detroit, Mich.
Phillips, G. P., Chief Met., Automotive Foundry Div., International Harvester Co., Chicago, Ill. (Mailing address: 12 Elmwood Ave., La Grange, Ill.)
Phillips, H. D., Plant Mgr., Lebanon Steel Foundry, Lebanon, Pa.
Phillips, W. J., Asst. Gen. Mgr., Symington-Gould Corp., 311 Oakdale Dr., Rochester, N. Y.
Porter, John W., Works Mgr., American Steel Foundries, East Chicago, Ind.
Post, Marshall, Vice Pres., Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Pragoff, Emile, Jr., Sales Supv., Hercules Powder Co., Delaware Trust Bldg., Wilmington, Del.
Priestley, K. H., Met., Eaton Mfg. Co., Fdry. Div., Vassar, Mich.
Pryse, L. W., Salesman, Hickman Williams & Co., First National Bank Bldg., Cincinnati, O.
Pugsley, William, Mgr. of Engrg., The Hays Corp., 750 E. 8th St., Michigan City, Ind.
Pyle, Adam, Jr., Secy.-Treas., Pyle Pattern & Mfg. Co., 1201 Sanford St., Muskegon, Mich.

Quartz, H. D., Gen. Supv. of Welding, Allis-Chalmers Mfg. Co., So. 70th St., Milwaukee, Wis.

Randall, C. P., Service Engr., Eastern Clay Products, Inc., Eifort, O. (Mailing address: 33 Bass St., Wollaston, Mass.)
Rassenfoss, J. A., Supervising Engr., Research Lab., American Steel Foundries, East Chicago, Ind.
Reeder, D. B., Met., Electro Metallurgical Co., 230 N. Michigan Ave., Chicago, Ill.
Reese, D. J., Met., International Nickel Co., 67 Wall St., New York, N. Y.
Reichert, W. G., Gen. Fdry. Met., American Brake Shoe & Foundry Co., Mahwah, N. J.
Reid, Vaughan, Pres., City Pattern Works, 1161 Harper Ave., Detroit, Mich.
Reininga, J., (Miss), Asst. Treas., American Foundrymens Association, 222 W. Adams St., Chicago, Ill
Reynolds, J. E., Supt., U. S. Pipe & Foundry Co., Bessemer, Ala.
Rich, H. M., Electro Metallurgical Sales Corp., 30 E. 42nd St., New York, N. Y.
Ries, Dr. H., 401 Thurston Ave., Ithaca, N. Y.
Riggan, F. B., Met., Key Co., East St. Louis, Ill.
Rishel, H. M., Works Mgr., American Steel Foundries, Cast Armor Plant, 3200 S. Dickey Rd., East Chicago, Ind.
Rittinger, C. J., Fdry. Met., Riley Stoker Corp., Foot of Walker St., Detroit, Mich.

Roast, Harold J., Vice Pres., Canadian Bronze Co., Ltd., 999 Delorimier Ave., Montreal, Que., Can.
Roberts, C. S., Vice Pres., Dodge Steel Co., 6501 Tacony St., Philadelphia, Pa.
Robinson, L. P., Dir., Core Oil Sales, Werner G. Smith Co., 2191 W. 110th St., Cleveland, O.
Roeming, E. H., Gray Iron Fdry. Accountant, Chain Belt Co., Gray Iron Castings Div., 1600 W. Bruce St., Milwaukee, Wis.
Romanoff, Wm., Vice Pres., H. Kramer & Co., 2119 S. Loomis St., Chicago, Ill.
Root, A. B., Jr., Asst Gen. Mgr., Hunt Spiller Mfg. Corp., 383 Dorchester Ave., Boston, Mass.
Rosenthal, P. C., Res. Engr., Battelle Memorial Institute, 505 King Ave., Columbus, O.
Roth, E. L., Pres. & Gen. Mgr., Motor Castings Co., 1111 S. 65th St., Milwaukee, Wis.
Rother, W. H., Met., Buffalo Foundry & Machine Co., 1543 Fillmore Ave., Buffalo, N. Y.
Roueche, W. Lee, Works Mgr., McWane Cast Iron Pipe Co., 1201 Vanderbilt Rd., Birmingham, Ala.
Rowe, C. E., Industrial Engr., MacDonald Bros., Inc., Chicago. (Mailing address: 1535 S. 60th Ct., Cicero, Ill.)
Rowe, H. J., Met. Engr., Aluminum Company of America, 2210 Harvard Ave., Cleveland, O.
Rudesill, L. H., Met., Griffin Wheel Co., 445 N. Sacramento Blvd., Chicago, Ill.
Ruppe, A. T., Fdry. Supt., Bendix Products Corp., South Bend, Ind.
Ruten, W. H., Asst. Prof., Industrial Processes, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Saeger, C. M., Jr., Met., National Bureau of Standards, Washington, D. C.
St. John, A. E., Met., Federated Metals Div., American Smelting & Refining Co., 120 Broadway, New York, N. Y.
St. John, H. M., Supt., Dept. No. 5, Crane Co., 4100 S. Kedzie Ave., Chicago, Ill.
Salzberg, H. K., Casein Co. of America, Bainbridge, N. Y.
Sawtelle, D. F., Met., Malleable Iron Fittings Co., Branford, Conn.
Schilling, P. R., Asst. to Pres., Superior Steel & Malleable Castings Co., Benton Harbor, Mich.
Schnee, V. H., Supv. Engr., Battelle Memorial Institute, 505 King Ave., Columbus, O.
Schubert, C. E., Asst. Prof., Mechanical Engineering Dept., University of Illinois, Urbana, Ill.
Schuh, A. E., Dir. of Res., U. S. Pipe & Foundry Co., Burlington, New Jersey.
Schumacher, G. A., Met., Albion Malleable Iron Co., Albion, Mich.
Schwartz, H. A., Mgr. of Res., National Malleable & Steel Castings Co., 10600 Quincy Ave., Cleveland, O.
Scobie, H. F., Instr., Foundry Practice, Mechanical Engineering Dept., University of Minnesota, Minneapolis, Minn.
Sedlak, F. J., Met., Ohio Brass Co., 324 Lexington Ave., Mansfield, O.
Sedlon, V. J., Pres., Master Pattern Co., 2100 W. Superior, Cleveland, O.
Sefing, F. G., Res. Met., International Nickel Co., 67 Wall St., New York, N. Y.
Shannon, L. N., Vice Pres., Stockham Pipe Fittings Co., Box 2031, Birmingham, Ala.
Sherman, R. A., Supv., Fuels Div., Battelle Memorial Institute, 505 King Ave., Columbus, O.
Sherwin, L. M., Fdry. & Pattern Shop Supt., Brown and Sharpe Mfg. Co., Providence, R. I.
Shoemaker, F. F., Armour Research Foundation, 3300 S. Federal St., Chicago, Ill.
Siegel, Miguel, Chief of Scientific Service, Head, Foundry Dept., Instituto de Pesquisas Technologicas, Sao Paulo, Brazil.
Simpson, H. S., Pres., National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.
Sims, C. E., Supv. Met., Battelle Memorial Institute, 505 King Ave., Columbus, O.
Smith, A. J., Met., The Lukenheimer Co., Beekman & Waverly Aves., Cincinnati, O.
Smith, E. B., Vice Pres., American Brake Shoe & Foundry Co., Brake Shoe & Castings Div., 230 Park Ave., New York, N. Y.
Smith, E. K., Maj., Army Ordnance Dept., Ind. Service, Tank & Armored Vehicle Div. (Mailing address: P. O. Box 2512, Washington, D. C.)
Smith, L. C., Engr., Spencer Turbine Co., Hartford, Conn.
Spencer, W. H., Molybdenum Section Chief, Tungsten Branch, War Production Board, 1534 Temporary Building R, Washington, D. C.
Spindler, W. A., Asst. Prof., Dept. of Metal Processing, University of Michigan, 2047 East Engineering Bldg., Ann Arbor, Mich.
Spooner, A. P., Met. Engr., Bethlehem Steel Co., Bethlehem, Pa.
Stantial, G. B., Fdry. Supt., Illinois Malleable Iron Co., 1801 Diversey Parkway, Chicago, Ill.
Starmann, G. H., Chief Met., Apex Smelting Co., 2537 W. Taylor St., Chicago, Ill.
Stavert, J. C., Asst. to Vice Pres., Babcock-Wilcox & Goldie-McCulloch, Ltd., Galt, Ont., Can.
Steinebach, F. G., Editor, *The Foundry*, Penton Bldg., Cleveland, Ohio.
Stettbacher, Wayne, Secy., Employers Assn. of Detroit, 2309 Book Tower, Detroit, Mich.
Stolzenburg, A. W., Chief Inspector, Aluminum Co. of America, 3311 Dunn Rd., Detroit, Mich.
Storie, D. M., Supt., Fittings, Ltd., Oshawa, Ont., Can.
Stuart, H. W., Res. Engr., U. S. Pipe & Foundry Co., Burlington, New Jersey.
Sugar, Alfred, Chief Met., Monarch Aluminum Mfg. Co., 9301 Detroit Ave., Cleveland, O.
Sullivan, J. D., Chief Chem., Battelle Memorial Institute, 505 King Ave., Columbus, O.

Taylor, H. F., Met., Naval Research Lab., Anacostia Sta., Washington, D. C.
Teetor, R. J., Pres., Cadillac Malleable Iron Co., Cadillac, Mich.
Tegman, R., Fdry. Met., American Brake Shoe & Foundry Co., Mahwah, N. J.
Thieme, C. O., Works Mgr., H. Kramer & Co., 1347-59 W. 21st St., Chicago, Ill.
Thomas, L. B., Chief Met., Campbell Wyant & Cannon Foundry Co., Muskegon, Mich.
Thomson, James, Chief Plant Engr., Continental Roll & Steel Foundry Co., East Chicago, Ind.
Timmons, G. A., Met., Climax Molybdenum Co., 14410 Woodrow Wilson, Detroit, Mich.
Tisdale, N. F., Met. Engr., Molybdenum Corp. of America, Grant Bldg., Pittsburgh, Pa.
Tobin, J. F., Sales Engr., American Blower Corp., 228 N. La Salle St., Chicago, Ill.
Touceda, E., 943 Broadway, Albany, N. Y.
Tour, Sam, Vice Pres., Lucius Pitkin, Inc., 47 Fulton St., New York, N. Y.
Trevithick, T. H., Fdry. & Patt. Shop. Supt., General Electric Co., Schenectady, N. Y.
Troy, E. C., Met., Dodge Steel Co., 6501 Tacony, Philadelphia, Pa.
Tucker, L. F., City Pattern Works, 422 E. Monroe St., South Bend, Ind.

Utley, S. Wells, Pres. and Gen. Mgr., Detroit Steel Casting Co., 4069 Michigan Ave., Detroit, Mich.

Vanick, J. S., Met., International Nickel Co., 67 Wall St., New York, N. Y.
Vial, F. K., Vice Pres., Griffin Wheel Co., 445 N. Sacramento Blvd., Chicago, Ill.
Vinning, R. E., Supv. of Methods, Revere Copper & Brass Co., Baltimore, Md.

Wade, C. W., Factory Training Supv., Caterpillar Tractor Co., 600 W. Washington St., Peoria, Ill.
Wagner, I. R., Vice Pres. & Gen. Mgr., Electric Steel Castings Co., Speedway, Indianapolis, Ind.
Wagner, J. A., Pres., Wagner Malleable Iron Co., Decatur, Ill.
Waldron, H. C., Fdry. Supt., Nordberg Mfg. Co., Milwaukee, Wis.
Walker, Stanton, Consulting Engr., National Industrial Sand Assn., Munsey Bldg., Washington, D. C.
Walls, F. J., Met., International Nickel Co., 8-217 General Motors Bldg., Detroit, Mich.
Walter, R. D., Res. Chem., Core Oil Dept., Werner G. Smith Co., 2191 W. 110th St., Cleveland, O.
Warchol, Michael, Met., Atlas Foundry Co., 131 S. Livernois, Detroit, Mich.
Ward, L. A., Mgr., Mill Control Dept., Chase Brass & Copper Co., Inc., 236 Grand St., Waterbury, Conn.
Wartgow, F. E., Time Motion Study Supv., American Steel Foundries, East Chicago, Ind.
Washburn, H. S., Pres., Plainville Casting Co., Plainville, Conn.
Waterfall, Arthur T., 2488 Virginia Park St., Detroit, Mich.
Weaver, F. L., Met., Great Lakes Foundry Sand Co., United Artists Bldg., Detroit, Mich.
Weaver, V. P., Asst. Met., American Brass Co., 414 Meadow St., Waterbury, Conn.
Webster, Donald, Chem., American Laundry Machinery Co., 50 Sherer St., Rochester, N. Y.
Weigand, S. A., Met., The Lunkenheimer Co., Beekman and Waverly Aves., Cincinnati, O.
Wertz, R. O., Fdry. Instr., Fullerton Union High School, Fullerton, Calif.
West, T. D., Consultant, Deere & Co., Moline, Ill.
Weston, B. M., Chem. Dir., Aristo Corp., 5944 E. Davison, Detroit, Mich.
Westover, C. E., Executive Vice Pres., American Foundrymen's Association, 222 W. Adams St., Chicago.
Westover, Jeff. Alan, Member of Staff, Dyer Engineers, Inc., 1650 Union Commerce Bldg., Cleveland, O.
Wick, James L., Jr., Pres., Falcon Bronze Co., 218 S. Phelps St., Youngstown, O.
Wieland, R. G., Plant Mgr., Forest City Foundry Co., 2500 W. 27th St., Cleveland, O.
Wilder, H. H., Senior Industrial Specialist, Forging & Castings Unit, W.P.B., Washington, D. C. (Mailing address: 1222 Woodside Parkway, Silver Spring, Md.)
Wilke, R. E., Met., Testing & Res. Labs., Deere & Co., Moline, Ill.
Williams, F. T., In Charge of Fdry. Prod., Enterprise Foundry Corp., 2902—19th St., San Francisco, Calif.
Wilson, L. C., Gen. Mgr., Reading Steel Casting Div., American Chain & Cable Co., Inc., Reading Pa.
Wine, W. C., Gen. Supt., Sibley Machine & Foundry Corp., 206 E. Tutt St., South Bend, Ind.
Wise, L. J., Mgr., Res. & Development, Chicago Malleable Castings Co., 120th & S. Racine, Chicago, Ill.
Woldman, N. E., Chief Met. Engr., Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.
Wolf, F. L., Chief, Graphite Allocation & Conservation, Branch "K," Materials Div., War Production Board, Washington, D. C. (Mailing address: 1344 Iris St., N.W., Washington, D. C.)
Wolff, Chris. J., Antioch Township, Ill.
Womochel, H., Res. Asst., Engineering Experiment Sta., Michigan State College, East Lansing, Mich.
Wood, S. V., Pres. & Mgr., Minneapolis Electric Steel Casting Co., 3800 N. E. 5th, Minneapolis, Minn.
Wood, T. J., Asst. Supt., American Brake Shoe & Foundry Co., Mahwah, N. J.
Woodliff, E. E., Foundry Sand Service Engineering Co., 14862 Forrer St., Detroit, Mich.
Woodward, R. C., Chief Met., Bucyrus-Erie Co., South Milwaukee, Wis.
Woody, W. L., Mgr., National Malleable & Steel Castings Co., Sharon, Pa.
Wornom, A. H., Appr., Instr., Newport News Shipbuilding & Dry Dock Co., Newport News, Va.
Wurscher, F. J., Met., Acme Steel & Malleable Iron Works, 39 Chandler, Buffalo, N. Y.

Young, E. R., Met. Engr., Climax Molybdenum Co., 230 N. Michigan Ave., Chicago, Ill.

Zabel, G. A., Asst. Supt., Universal Foundry Co., Oshkosh, Wis.
Zahn, Charles, Fdry. Supt., Vilter Mfg. Co., 2217 S. 1st, Milwaukee, Wis.
Zemanek, R. J., Met., U. S. Graphite Co., Saginaw, Mich.
Ziebell, A. C., Pres. & Treas., Universal Foundry Co., Oshkosh, Wis.
Ziegler, N. A., Res. Met., Crane Co., 4100 S. Kedzie Ave., Chicago, Ill.
Zirzow, E. C., Core Room Foreman, National Malleable & Steel Castings Co., 10590 Quincy Ave., Cleveland, O.
Zuege, D. C., Tech. Dir., Sivyer Steel Casting Co., Milwaukee, Wis.

Steel Division Issues First Report On Magnetic Powder Testing

The following report is the first issued by the Committee on Magnetic Powder Testing of the A.F.A. Steel Division. Interest in the method of non-destructive testing of steel castings is due largely to the fact that many castings for war purposes are required to be tested by magnetic methods. Illustrations accompanying the report show applications of the method in actual test pieces.

THE Steel Division Committee on Magnetic Powder Testing was organized in October, 1941, for the purpose of summarizing the information available on this type of non-destructive testing. The Committee has encountered considerable difficulty in gathering definite information concerning the use of the method on production castings. This has been due to the fact that at the present time the method is used primarily by government inspection agencies on ordnance or other castings, upon which publication of information is restricted.

The information given below, therefore, is only an introduction to the subject. It is advisable to introduce any comparatively new subject with a few fundamental principles and definitions in order that the discussion may be based on common terms.

Definitions

(1) *Magnet* — A magnet is a piece of material which has the property to magnetize and attract ferro-magnetic substances such as iron, steel, cobalt and nickel. A magnet has at least two poles, commonly called the North and South poles due to tendency of magnetic materials to align themselves with the earth's magnetic field and point to the earth's North and South magnetic poles.

There are two types of magnets, as follows:

(a) *Permanent Magnets,* which may occur in nature, such as the mineral magnetite or which may be produced artificially by magnetizing a hardened steel or some special alloys such as Alnico.*

(b) *Electromagnets,* which are made by surrounding an iron core by a coil winding through which an electric current is passed. Electromagnets are magnetic and will attract ferromagnetic materials only while a current is flowing through the winding. A common example of this type of magnet is the lifting magnet used in moving magnetic materials in the foundry.

(2) *Magnetic Materials* — The strongly magnetic materials are those mentioned previously: Iron, steel (except austenitic steels), cobalt and nickel, and special alloys of these constituents. The soft steels and irons cannot be permanently magnetized, but they will assume the characteristics of a magnet when they are used as the core of an electromagnet or when they are near or in contact with any magnetizing force, such as an electromagnet or permanent magnet.

(3) *Magnetic Field* — This is the name given to the space adjacent to the pole of a magnet. All magnets have polarity, and like poles will repel each other, while unlike poles will attract.

(4) *Lines of Force* — Lines of force are the physicist's means of representing a magnetic field diagramatically. It should be understood that they are used only as a means of explaining magnetic phenomena and that they do not really exist as "lines of force."

(5) *Retentivity* — This is the property of retaining magnetism. As noted previously, the hard steels and special alloys have a high retentivity and will remain permanently magnetized. The soft steels and irons have low retentivity and lose their magnetism as soon as the magnetic field is removed.

(6) *Longitudinal Magnetism* — The simplest example of longitudinal magnetism is the ordinary bar magnet, with its North and South poles and the return path through the air. The usual method of producing longitudinal magnetism is by inserting the piece, or part of it, in an energized coil or solenoid.

(7) *Circular Magnetism* — Circular magnetism may be induced by the passage of current through or near the piece or, in the case of a hollow cylinder, by passing an energized conductor through the bore. If a current is passed through a copper wire, a magnetic field will be created around the wire. If the wire were to be grasped in the right hand with the thumb extended in the direction in which the current is flowing, the fingers would indicate the direction of the "lines of force." The magnetic field would be indicated as moving from the palm of the hand through the fingers.

If the wire were to be placed in the center of a ferro-magnetic cylinder, a magnetic field would be induced in the cylinder, revolving on a closed circular path. Similarly, if a current is passed through a ferro-magnetic rod a circular magnetic field would be induced in the rod.

With this type of magnetism the flux is considered to pass in a continuous circle with practically no external field and no noticeable polarity.

(8) *Consequent Polarity* — Consequent polarity describes the condition when more than two poles are present. For example, a bar magnet magnetized in such a way that there is a North pole at each end of the bar and a South pole in the center of the bar is said to have "consequent poles."

Magnetic Testing

The principles employed in magnetic testing may be explained by using these simple definitions. Let us start with a simple bar magnet.

If we note the direction of the lines of force by that simple ex-

*Patented Process.

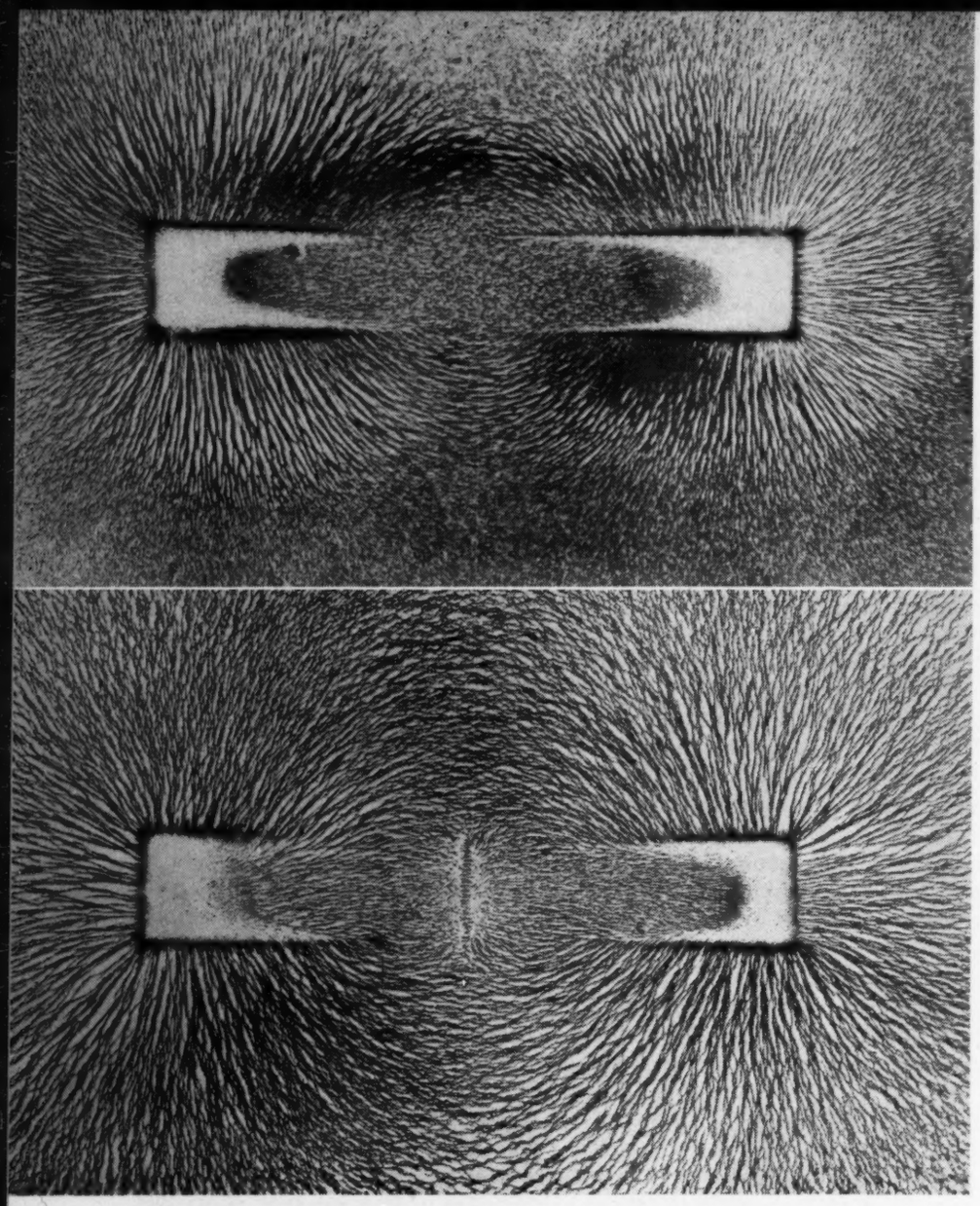


Fig. 1 (Top)—Bar of high carbon magnet steel, 1 inch square and 6⅜ inches long. magnetized in the yoke. Pattern obtained by sifting iron filings through 100 mesh sieve onto white paper. Fig. 2 (Bottom)—Same bar as in Fig. 1, cut in the middle.

periment used in elementary physics and place a piece of paper over the magnet, sprinkle iron filings on the paper, and then tap the paper slightly, we find the lines of force radiating from each pole with the greatest mass of filings concentrated near the poles (See Fig. 1.) If we break this magnet in two and repeat the experiment, we find that each piece now has a North and South pole and that a mass of filings has collected at the "break." (Fig. 2.)

This experiment may be repeated many times and in each instance the piece broken off will contain its North and South poles. The pieces pushed together will exhibit "consequent poles" when tested with iron filings, and the "break" will in each case be indicated by a concentration of the iron filings.

Circular Magnets

If we should take a bar magnet and bend it into a circle and again use filings to indicate the field, we would again find a concentration of filings at the two poles which have been brought near each other. It is obvious that the conditions produced by a bar magnet bent into a circle can also be produced by merely cutting a slot through a cylinder magnetized circularly, by passing a current through a wire at its center. (Figs. 3 and 4.)

In the solid cylinder the flux flows continuously and, as stated previously, there is no appreciable external field and no noticeable poles. Once this continuous circular flux path is broken by a slot, we have two poles and flux leakage, conditions similar to those created by bending a bar magnet into a circle.

Similarly, if we cause a break in the circular flux lines of a circularly magnetized solid bar, we again create local poles or local flux leakage which can be indicated by the use of iron filings as in our simple experiment with the bar magnet. (Figs. 5, 6, 7 and 8.) These local poles or local flux leakages will occur wherever there is an abrupt change in the magnetic permeability of the test piece. Thus several slots in the circularly magnetized bar will produce a series of consequent poles, each of which can be detected by the same means.

Special Powder Test

All of the illustrations shown so far have been produced by shaking iron filings on a piece of white paper, placed over the magnetized piece. Fig. 9 was obtained by using a light colored powder especially prepared by this type of testing on the specimen illustrated in Figs. 7 and 8. It is interesting to note that an additional portion of the crack is revealed by using this type of powder.

It is not necessary to have an actual slot or crack to produce these local poles. They may be caused by the presence of nonmetallics such as sand, slag, etc., or by an abrupt change in the permeability of the material caused by variations in heat treatment, high stresses, etc.

Basic Test Conditions

To summarize, two basic conditions are required in this type of magnetic testing:

(1) An abrupt change in the permeability within the path of magnetic flux flowing through a magnetized piece of material which produces local poles or local flux leakage.

(2) A method of detecting these local poles. This condition is satisified by the use of finely divided ferromagnetic powders which offer a lower reluctance path than a liquid or air and hence tend to gather in the leakage field and thus define the outline of the field.

Every testing method has its limitations and variations which must be taken into account. This method of inspection is no exception. It is, of course, applicable only to magnetic materials. Alloys which are only faintly magnetic do not produce satisfactory results.

Magnetic Discontinuities

Defects in material tested by this method produce magnetic discontinuities. Magnaflux testing outlines these discontinuities. The outline produced by the powder is called an indication. It should not be assumed that all indications are the result of defects. The shape of the magnetic discontinuity is most important. Best results are obtained when the magnetic discontinuity cuts the lines of force at a 90 degree angle. Long, narrow discontinuities parallel to the lines of force give very poor indications or none at all.

It is evident that magnetic discontinuities near the surface will be detected readily whereas magnetic discontinuities lying below the surface will have diffused leakage fields which result in diffused outlines which are difficult to interpret.

Porosity can be detected when it is near the surface and in deeper locations where the cavities are large and few in number. If deep seated porosity is composed of a large number of small holes, the possibility of detecting it is slight.

In all cases, the outline of the magnetic discontinuities and the depth at which magnetic discontinuities can be found will be dependent upon the strength of the leakage field present. This is dependent upon the shape of the piece under test and the strength of the magnetizing force.

Methods of Magnetizing

Magnetic tests may be conducted by using residual magnetism in a previously magnetized piece, or by the so-called continuous methods where the powder is applied while the test piece is under the influence of the magnetizing force. The latter method is preferred for the low carbon steels and only this method will be discussed here.

The type of magnetization desirable will depend upon the material to be tested and the location where the test is to be made. The following remarks, therefore, are general in character and will not apply to all conditions. The three methods which are found in common practice are the use of the test piece itself as the conductor (direct method), the use of the magnetic yoke (indirect method), and the use of the solenoid (indirect method).

The "magnetic yoke" is merely an electromagnet of the horseshoe (or modified horseshoe) type. The two poles of the electromagnet are placed on the test piece, the magnetic circuit is completed through the test piece, and the area between the poles is thus available for testing.

In the solenoid method a conductor is wrapped around the test piece. A current passing through the conductor will magnetize the piece by induction.

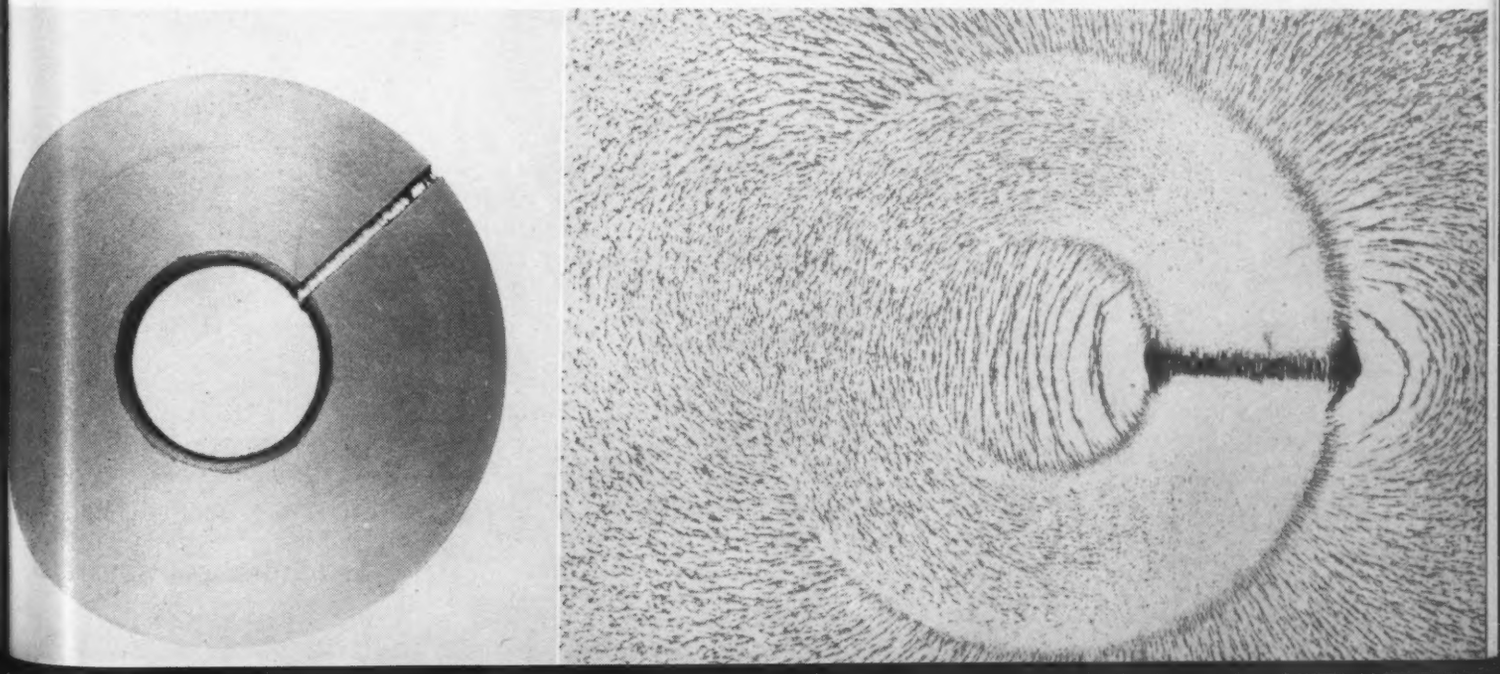
For long slender pieces both the solenoid and "direct" methods may be employed to insure a complete examination of the piece.

The magnetic yoke is usually used only on pieces which are difficult to test with either the direct or solenoid methods, as this method is not as sensitive as either of the other methods.

Direct current is usually used but alternating current is suitable for some types of tests. Alternating current may also be used with proprietary equipment which converts it to broken alternating current or pulsating direct current, which produce satisfactory results.

The direct current required may be used at any line voltage for magnetic yokes, but a low voltage-high amperage current is desirable when the test piece is to be used as the conductor. Current of this type may be ob-

Fig. 3 (Left)—Piece of high carbon tool steel, 2⅝ inch diameter, ⅞ inch thick, 1 inch diameter center hole, with 1/16 inch slot simulating conditions of a circular magnet. Fig. 4 (Right)—Same piece shown in Fig 3, magnetized in the yoke, covered with white paper and iron filings sifted on as in Fig. 1.



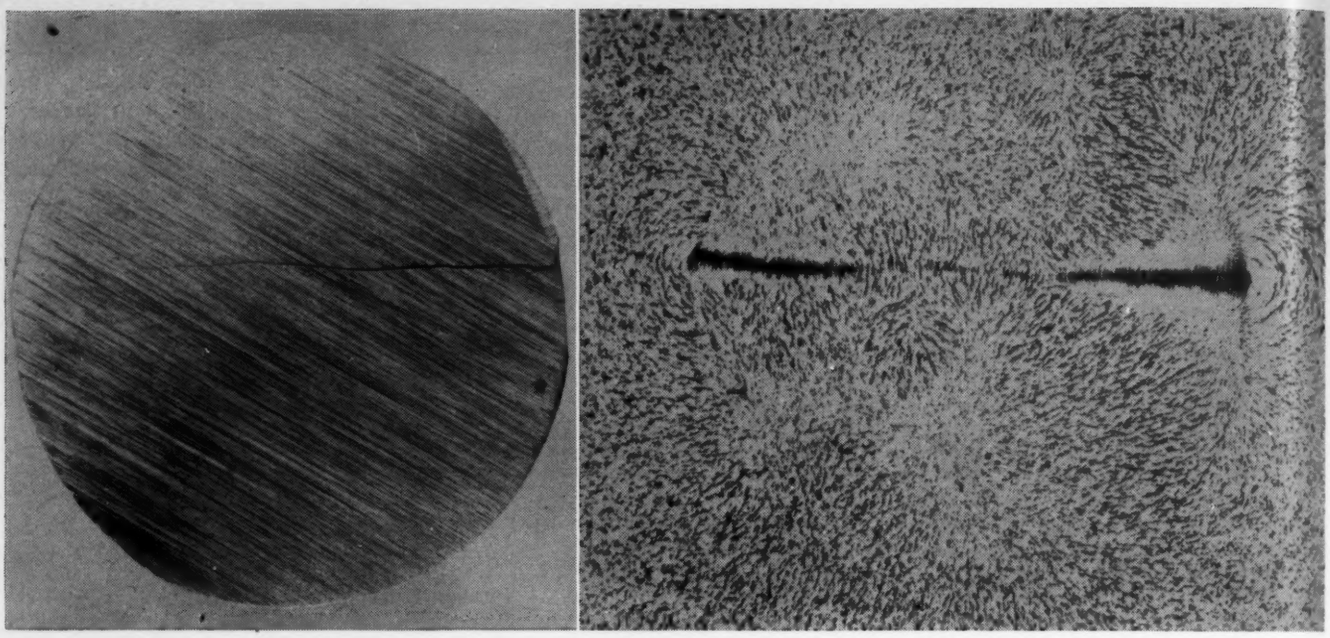


Fig. 5 (Left)—A cylinder of high carbon tool steel, 2 inch diameter x 6½ inches long, cracked in quenching. Specimen was placed between copper plates and 500 amperes passed through it with a welding machine. Fig. 6 (Right)—Same crack shown in Fig 5, as revealed by use of white paper and iron filings.

tained from storage batteries or motor generator sets. A modern welding generator may be used in many instances.

Inspection Medium

The powder to be employed should have the following characteristics: (1) High permeability, (2) low coercive force, (3) low retentivity, (4) good mobility.

The powder, after properly magnetizing the part, may be applied by either of two methods, commonly called "dry" method and "wet" method. For either method, proprietary powders of the proper size and shape are available, which have colored coatings to increase the contrast with the background and thus facilitate testing. Other powders, which are not of a proprietary nature, also have been used and gave satisfactory results.

The powders used for the "dry" method are usually treated to increase their mobility and prevent agglomeration of the powder. The powder may be applied from a hand-shaker, bulb-blower or mechanical blower. The use of the hand-shaker is limited to nearly horizontal surfaces, whereas the blowers may be used on vertical or overhead surfaces.

In the "wet" method the pow-

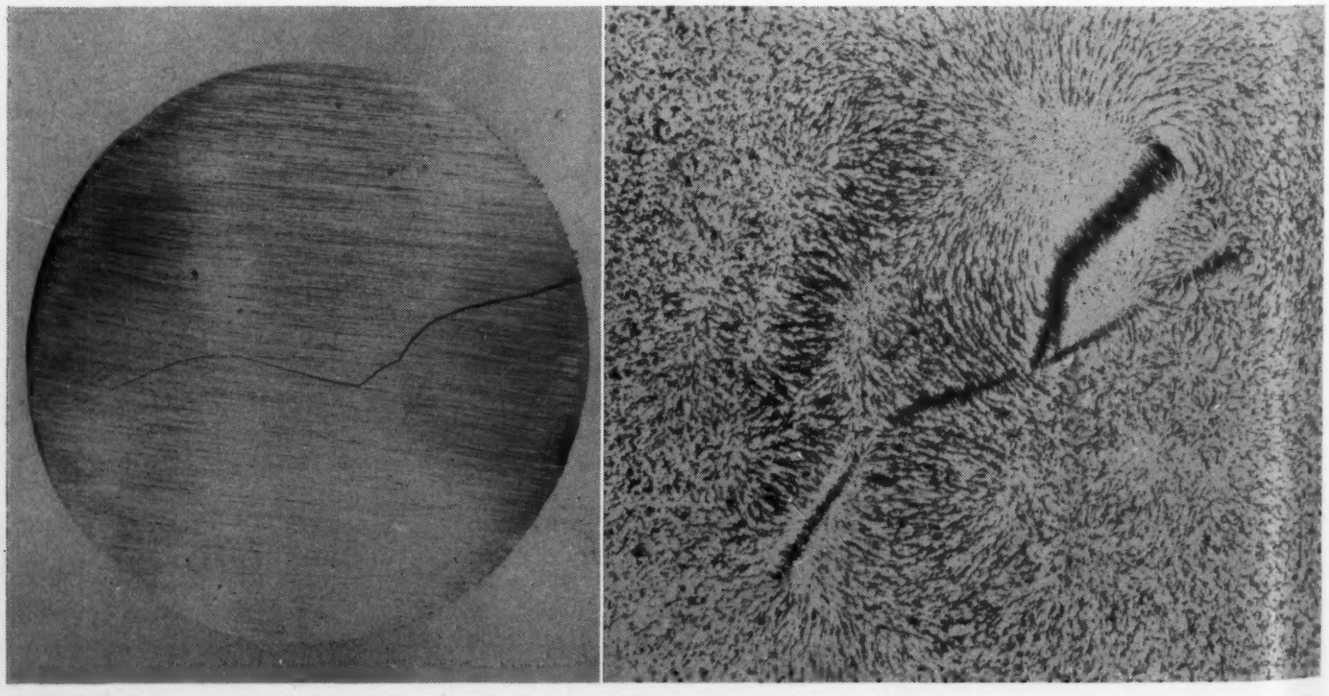


Fig. 7 (Left)—Opposite end of specimen bar illustrated in Fig. 5.—Fig. 8 (Right)—Same crack as in Fig. 7, as revealed by use of white paper and iron filings.

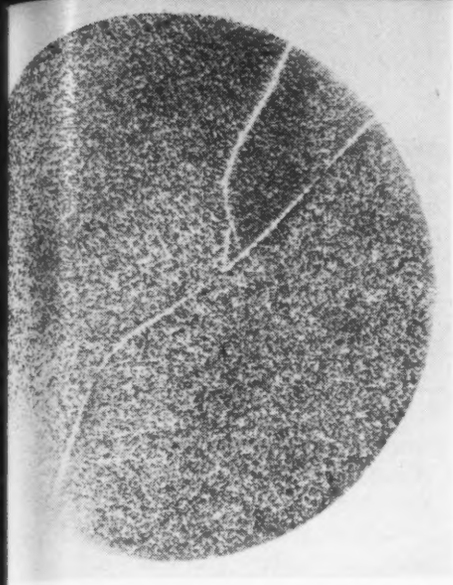


Fig. 9—Same crack as in Fig. 7. In this case no white paper was used. Instead, magnaflux powder was employed in place of iron filings. Since the magnaflux powder is light in color it was necessary to turn the piece so that it did not reflect too much light.

der particles are suspended in liquids such as kerosene, gasoline or carbon tetrachloride. A fire hazard is sometimes involved which requires the use of carbon tetrachloride and, if used, ventilation must be provided, as the fumes are poisonous. The liquid can be sprayed or flowed over the part to be inspected; if flowed, care should be exercised so that potential indications are not washed away by the force of the stream.

Surface Preparation

The surface is important in this type of testing. In general, the smoother the surface the better the results will be. In examining rough castings, careful interpretation of the results is essential, as many minor surface imperfections may appear to be serious defects. All heavy layers of rust, scale and grease should be removed prior to testing. Thin, even layers of rust or scale will not cause much difficulty.

Demagnetization

Demagnetization is an important consideration in some applications. There are many methods which may be employed and the subject should be studied thoroughly if demagnetization is required. The simplest method which is applicable in many installations is a large alternating current solenoid through which the pieces may be passed and slowly withdrawn.

Demagnetization is not required at all if:

(a) The piece is to be heat treated at a temperature high enough to cause demagnetization;

(b) The piece has low retentivity. (This includes all low and medium carbon steels and some low alloy steels);

(c) The piece is to be magnetized in final assembly.

As previously pointed out, all magnetic indications do not represent material defects. Therefore, results should be clearly interpreted, to be of value. The approximate location, number and size of indications should be reported and described as fully as possible. Cracks, porosity, inclusions, etc., should also be identified. This information, together with the service requirements of the part, must be considered when the acceptability or repair of a part is subject to question.

R. A. Gezelius, *Chairman*
T. N. Armstrong,
A. P. Spooner,
J. A. Duma,
W. J. Phillips.

Greenlee Bros. Joins Foundries Receiving Army-Navy "E" Award

"THE Army Air Force congratulates the management and workers for your excellency in workmanship on the critical machines you are manufacturing, for your skillful management, your health efficiency, sanitation, plant protection and, last but not least, your high labor standards."

With these words the "distinguished service medal" of war production, the Army-Navy "E" award, was presented to Greenlee Bros. & Co., Rockford, Ill., recently for high achievement in production of war equipment. The famous pennant was presented September 3 at a ceremony on the company grounds, George C. Purdy, president, receiving the award on behalf of his company.

Actual presentation was made by Lt. Col. Edward H. Bowman, chief of the Chicago Procurement District, before a gathering of over 3,000 employees, families and guests. "E" pins were also presented to all the firm's employees.

Besides company officials, guests present included Brig. Gen. John M. Willis, Commandant, Camp Grant, Ill., and his staff; representatives of the Chicago Ordnance District and the War Production Board, and several city and county officials. Representing the U. S. Navy, Lt. Commander R. J. Twyman presented the "E" pins and congratulated the employees on their all-out effort in vital war production work.

Greenlee Bros. & Co. have been members of A.F.A. for a

Over 3,000 employees of Greenlee Bros. & Co., Rockford, Ill., with their families, friends and guests, stand at attention on the company grounds during the playing of the National Anthem, on September 3. In the ceremonies that followed, the company's excellent record in war production work was recognized by presentation of the joint Army and Navy "E" flag.

George C. Purdy (right), President, Greenlee Bros. & Co., Rockford, Ill., receives the distinguished Army-Navy "E" flag for achievement in war production by his company. Lt. Col. Edward H. Bowman (left), chief of Chicago Procurement District, makes the presentation.

number of years. Among those in the organization most active in Association affairs are Fred E. Rundquist, foundry manager, and John Clausen, metallurgist.

C. C. Gibbs, National Malleable Head, Dies

CARL C. GIBBS, president of the National Malleable & Steel Castings Co., Cleveland, since 1934, died September 9 there. Mr. Gibbs had been connected with the company continually since 1906, first entering the Indianapolis plant in that year as a junior clerk. In 1910 he became a salesman for the company there, transferring to Cleveland headquarters in 1919 as sales manager, but returning to Indianapolis as plant manager the following year. In 1928 he again went to Cleveland, this time as assistant to the president, and six years later became the head of the entire organization.

Mr. Gibbs was born in Indiana in 1882 and received his early education in the schools of Indianapolis. As one who knew the foundry business from the bottom up, he was an active member of several associations of the industry, including American Foundrymen's Association. He served as a Director of A.F.A. from 1926 to 1929, and also was a member of the Malleable Iron Research Institute and the Steel Founders Society of America.

Foundry Finds Job Instructor Training Really Trains Men

MANY foundries are among the several thousand industrial concerns that have availed themselves of the Job Instructor Training program originally offered by the War Production Board, now an activity of the War Manpower Commission. One foundry heavily engaged in war production work that has adopted the program with noteworthy results is the Gunite Foundries Corp., Rockford, Ill. Their experience with J.I.T., as the plan is familiarly known, is typical of those who have made use of this 10-hour, streamlined, standardized training procedure.

When the program was first presented to the Gunite organization, plant officials frankly admit, they were skeptical of what it could do for them. Like most war production plants, their need for a more rapid means of training new men was great, but they felt that "most of the things given for nothing usually are worth about that much."

Program Proves Value

The first group of Gunite men given J.I.T. were assistant foremen, who became so enthusiastic over it that a second class of head foremen was organized, with the following results quoted from a recent letter received from D. P. Forbes, president of the company:

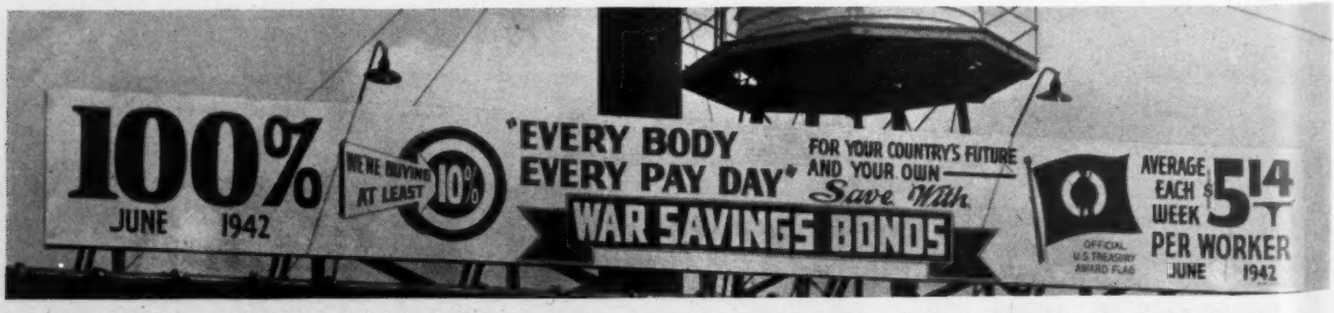
"Since then we have had additional classes of experienced workmen in each department. Now, when our personnel manager hires an inexperienced man, we know that he will be quickly and properly trained in his duties. The Job Instructor Training Plan really works."

A.F.A. Urges Use

Recognizing the value of the program, A.F.A. called the attention of all chapter officers to the plan several months ago, and since then a number of chapters have taken steps to have J.I.T. representatives address their meetings and explain the plan to their members. The program trains skilled workers in how to convey their skill to others correctly, quickly and efficiently.

Specific Time Savings

As an example of results achieved through this training program, a large bearing manufacturer recently timed inexperienced or "green" men on grooving valve tappet rollers, normal production being 700-800 pieces per 8-hour day. On the first day, a green man without J.I.T. produced only 300 pieces; a green man with Job Training, 650 pieces in 8 hours on his first day. In another case, polishing outside races, normal time 400-500 pieces per 8 hours, one green man produced 200-225 pieces the first day without J.I.T., whereas two green men with Job Instruction Training averaged 467 pieces each their first day of 8 hours.



CAN YOUR PLANT SAY THE SAME OF EMPLOYEE WAR BOND PURCHASES?

New Members

During the so-called "slow" months of midsummer, the number of new members held up remarkably well, and now that the chapter's Fall meeting schedules have begun it can be expected that the total will continue to increase. This month, for example, 17 chapters report a total of 65 new A.F.A. Members.

(August 16 to September 15, 1942)

Conversions:

Company from Personal—

Lawran Foundry Co., West Allis, Wis. (L. J. Andres, Vice-Pres.)

San Francisco Stove Works, San Francisco, Calif. (Ralph C. Noah, Mgr.)

Central New York Chapter

***Stanton Foundry, Inc., Solvay, N. Y. (George Stanton, Pres.)**

Chesapeake Chapter

Bureau of Aeronautics, Technical Information Section, Navy Dept., Washington, D. C.

Chicago Chapter

Chas. M. Bossong, Special Engr., American Steel Foundries, East Chicago, Ind.

Edw. S. Christiansen, Vice-Pres., Apex Smelting Co., Chicago, Ill.

Glenn O. Cox, Process Inspector, American Steel Foundries, East Chicago, Ind.

Chas. O. Howe, Asst. Supt., American Steel Foundries, East Chicago, Ind.

Sixten Langenberg, Special Engr., American Steel Foundries, East Chicago, Ind.

Frank Mueller, Shop Supt., American Steel Foundries, East Chicago, Ind.

Louis Naumoff, Sand Control Foreman, American Steel Foundries, East Chicago, Ind.

Chas. H. Neyer, Fdry. Foreman, American Steel Foundries, East Chicago, Ind.

Frank H. Peterson, Instructor, Northwestern Technological Institute, Evanston, Ill.

H. K. Swanson, Owner, Swanson Pattern & Model Works, East Chicago, Ind.

Cincinnati District Chapter

Maurice Biggs, Leadman in Foundry, Wright Aeronautical Corp., Lockland, Ohio.

Alfred W. Magnuson, Tech. Advisor, Wright Aeronautical Corp., Lockland, Ohio.

Russell S. Whitehead, Cincinnati, Ohio, Electro Refractories & Alloys Corp., Buffalo.

Detroit Chapter

Robert E. Cope, Met., Aluminum Co. of America, Detroit, Mich.

G. L. Galmish, Met., Michigan Malleable Iron Co., Detroit, Mich.

Stephen Kota, Inspector, Aluminum Co. of America, Detroit, Mich.

Davidge H. Rowland, Met., McConway-Torley Corp., Pittsburgh, Pa.

Earl T. Shay, Foreman, General Foundry & Mfg. Co., Flint, Mich.

Eastern Canada and Newfoundland Chapter

Henry Barnett, Director of Research, Electric Steels Ltd., Cap De La Madeleine, Que.

Metropolitan Chapter

***A. Allan & Son, Harrison, N. J. (William T. Allan, Sales Mgr.)**

Otto A. Blaschke, Teacher, Machine & Metal Trades High School, New York, N. Y.

Edgar C. Slaght, Jr., Raw Material & Casting Inspector, Sperry Gyroscope Co., L. I., N. Y.

Michiana Chapter

H. T. Lewis, Chicago, Ill., Salesman, Harbison-Walker Refractories Co., Pittsburgh

Andrew Peterson, Mall. Foreman (Charge of Melting) Oliver Farm Equipment Co., South Bend, Ind.

D. P. Phillips, Fdry. Process Engr., Bendix Aviation Corp., South Bend, Ind.

John Sokola, Mall. Foreman (Cleaning & Annealing) Oliver Farm Equipment Co., South Bend, Ind.

Phillip Starr, Gray Iron Supt., Casting Service Corp., La Porte, Ind.

Northeastern Ohio Chapter

Robert T. Wood, Chief Met., American Magnesium Corp., Div. of Aluminum Co. of America, Cleveland, Ohio

Northern California Chapter

***Electric Smelting Co., San Francisco, Calif. (Harold L. Phillips, Mgr.)**

Eldo Finley, Supt., San Francisco Stove Works, San Francisco, Calif.

Oren Smith, Clerk, San Francisco Stove Works, San Francisco, Calif.

Northern Illinois-Southern Wisconsin Chapter

Harry R. Norris, Met., Fairbanks-Morse Co., Beloit, Wis.

Ontario Chapter

W. O. Maclean, Canadian General Electric Co., Ltd., Toronto, Ont., Canada

J. L. Spence, Canadian Refractories, Ltd., Hamilton, Ont., Canada

***Waterous Limited, Brantford, Ont., Canada (Donald M. Waterous, Pres. & Gen'l Mgr.)**

Quad-City Chapter

A. A. Szidon, Pekin Foundry & Mfg. Co, Pekin, Ill.

St. Louis District Chapter

Francis E. Abraham, Plant Engr., American Steel Foundries, East St. Louis, Ill.

Paul F. S. Inman, General Steel Casting Corp., Granite City, Ill.

***Tulsa Winch Mfg. Corp., Tulsa Okla. (Owen L. Shirley, Engr.)**

Southern California Chapter

Tom Brindle, Owner, Standard Incinerator, Los Angeles, Calif.

Jack W. Dameron, W. Wesley Mills Co., Los Angeles, Calif.

Ben F. Doak, W. Wesley Mills Co., Los Angeles, Calif.

Ernest M. Hunt, Molder, R. H. Osbrink Mfg. Co., Los Angeles, Calif.

***W. Wesley Mills Co., Los Angeles, Calif. (W. Wesley Mills.)**

Selmer Westby, Salesman, Eastern Iron & Metal Co., Los Angeles, Calif.

Western Michigan Chapter

***East Jordan Works, East Jordan, Mich. (Theodore E. Malpass.)**

Harold G. Seamans, Eng. Dept., Campbell, Wyant & Cannon Co., Muskegon, Mich.

Wisconsin Chapter

Kenneth C. Anderson, Chief Analyst, War Production Board, Milwaukee, Wis.

Clyde Hofmann, Sand Control, Sivyer Steel Casting Co., Milwaukee, Wis.

W. John Hufschmidt, Purch. Agent, Smith Steel Foundry Co., Milwaukee, Wis.

Gilbert C. Krueger, Patt. Foreman, Allis-Chalmers Mfg. Co., West Allis, Wis.

Bernhard C. Nienow, Patt. Foreman, Allis-Chalmers Mfg. Co., West Allis, Wis.

Theodore F. Schmidt, Maint. Foreman, Allis-Chalmers Mfg. Co., West Allis, Wis.

*Company members.

Alexander L. Stewart, Student Engr., Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fred Treder, Fdry. Foreman, Valley Iron Works Co., Appleton, Wis.
*Valley Iron Works Company, Appleton, Wis. (R. A. Peterson, Pres.)

Outside of Chapter

Nathan Janco, Owner, Centrifugal Casting Machine Co., Tulsa, Okla.
Wm. E. Driscoll, Dallas, Texas
G. P. Jenkins, Owner, La Grange Iron Works, La Grange, Ga.
Colin Howel Kain, Dir. & Fdry. Mgr., Lake & Elliot, Ltd., Braintree, Essex, England
J. L. Lessman, Asst. Met., Fort Pitt Steel Casting Co., McKeesport, Pa.
*Manufacturers' Iron Foundry, Inc., Bridgeport, Conn. (Fred R. Carstensen, Sec'y.)
Josue Piccini de Santa Maria, Rio Grande do Sul, Brazil

Random Comments

FOUNDRY TEAMWORK

DR. H. W. GILLETT, technical director, Battelle Memorial Institute, Columbus, Ohio, this year presented the fifth Edward Williams Memorial Lecture to the Institute of British Foundrymen at their annual convention in London. Apropos was the title, "Foundry Teamwork."

In his address, Dr. Gillett made many statements which are gems and still are applicable, although they may have been said in other works many times before. One of the best is: "Published information is as free as water, but it has to be swallowed before it will quench thirst." This is another way of saying "You can lead a horse to water, etc."

Upon the swapping of practical experience, he said:

"Sometimes it is to the advantage of the more progressive . . . to help out a newcomer or a weak sister, even though a direct competitor, in the case *where the competitor is making so low a quality product as to give that product a bad name among ultimate consumers,* so that assistance on quality control may readily be given, when assistance on reduction of operating costs would be withheld."

In commenting upon the results of competition among methods of manufacture, Dr. Gillett said:

"Welding, forging, even powder metallurgy, are developing under wartime pressure as strong competitors of castings; plastics likewise will offer competition in limited fields. Within the foundry industry, aluminum and magnesium, whose production has been so vastly increased, will be seeking larger use on the basis of reduced cost of those raw materials. Gray iron, malleable iron, cast steel, and the copper-base alloy castings will increasingly be under attack by other materials and other methods of fabrication.

"This is fine from the point of view of the general public, for it leads to better and cheaper materials of engineering. *But if no defense is put up by bettering and cheapening the old-line foundry products, the shareholders and the workmen of the old-line foundries will not be the outstanding beneficiaries of postwar industrial activities."*

He also paid a compliment to your Association when he said:

"Most American metallurgical societies originated from the desire of operating men, superintendents, and foremen to get together and exchange information. The Papers presented in the early days dealt with highly practical topics, and the discussion was entered into by the practical men. As time went on, the Papers tended to become more of a theoretical, or at least of a highly advanced nature, which only the specialist can appreciate, and convention programmes became so crowded that there was no time for adequate discussion. The American Foundrymen's Association has probably succumbed to this trend less than most other societies, but has a constant struggle to maintain a flow of practical Papers."

The latter brings up a moot point. A practical man often has many ideas and much knowledge which the technical man does not possess—tricks of the trade to speed production. It is only through co-operation between the practical and the technical that the maximum progress can be made. Most technical men, unlike practical men, are not too averse to writing.

One of the great problems of the American Foundrymen's Association has been—and continues to be—the difficulty of obtaining papers of a practical nature which would aid the industry as a whole. You practical men sit down and give us your ideas. Let us have your comments in plain everyday language. Many of you have information that would benefit the industry. Come forward with it and do your part not only to advance the industry but the country in its war efforts. Remember, what may be common, ordinary, everyday practice to you may be unknown to foundrymen in another section of the country.

GET IN THE SCRAP WITH SCRAP

TODAY we are engaged in a total war, globe-wide in its scope. To win that war we must put forth a total effort. Our armed forces are fighting on the battle-front—your cooperation is needed on our home front. To provide materials needed by our fighting forces, every pound of scrap iron, steel, metal, rubber, rags and burlap must be salvaged. Seventeen million *additional* tons of scrap iron and steel alone are required to bring our war program to full strength.—*"War Production Board Bulletin."*

FIRE PREVENTION WEEK OCTOBER 4-10

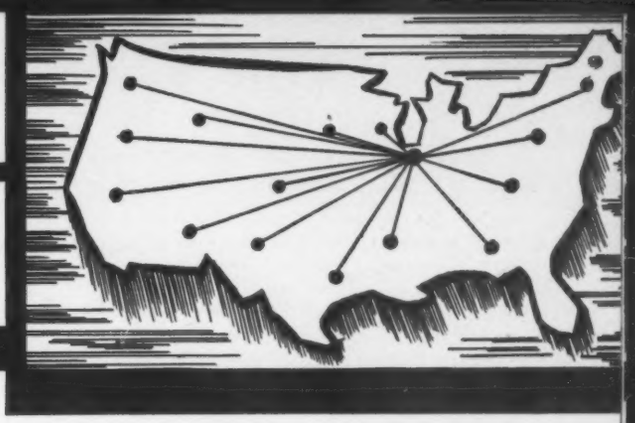
President Roosevelt has chosen the week of October 4-10 as Fire Prevention Week. Fire is the enemy of your plant, especially during the present times. It causes loss of life, loss of time, loss of materials, loss of production, all of which are critical in the war effort.

As an example, four fires caused the loss of 31,700,000 lb. of rubber, $250,000 worth of silk for Army and Navy parachutes, 10,000 tons of cork for munitions and 1,500,000 lb. of wool for uniforms. We could build 600 big bombers for what fires cost us each year.

And it is not always large fires that cripple production. Witness the fact that a $5,000 fire in a plant making small but essential airplane parts, held up the completion of the entire output of seven aircraft manufacturers for weeks.

Don't let your plant do this. Protect your company, plant, employees, materials and processes against fire. Make Hitler & Co. cry—not smile.

Chapter Activities



Michiana Chapter Elects New Officers and Holds Stag Outing

By L. L. Andrus,* Mishawaka, Indiana

THE Michiana Chapter of of A.F.A. opened its 1942-43 season September 12 on the grounds of the Elkhart Country Club, Elkhart, Ind., with a big outing, giving members and guests "time off" from war production for a day. Foundrymen and suppliers mingled on the golf course, softball grounds, and horseshoe courts, followed in the evening by a chicken dinner and awarding of prizes. For a highly successful day a vote of thanks was extended to the Picnic Committee, including Vic C. Bruce, Buckeye Products Co., Elkhart, Ind., as chairman; Wm. V. Johnson, Oliver Farm Equipment Co., South Bend, Ind.; Joe Brajcki, Bendix Aviation Corp., South Bend; Bill Bachman, New York Central R.R., Elkhart, and Eric Gustafson, Sibley Machine & Foundry Co., South Bend.

The first prize winners of the sports events were as follows: Bob Pequignot, American Foundry Equipment Co., Mishawaka, Ind.; Steve Lowe, Rochester Metal Products Co., Rochester, Ind., and Ellis Brown, Bremen Gray Iron Foundry Inc., Bremen, Ind.

New officers and directors who will guide the chapter during the coming year were introduced during the evening, headed by the new chairman, H. Klouman, Michiana Products Corp., Michigan City, Ind., and the new vice-chairman, R. E. Patterson, Elkhart Foundry & Machine Co., Elkhart. Directors of the chapter were announced for the year as follows:

(Newly elected, to 1945)—Jos. Brajcki, Bendix Products Div., Bendix Aviation Corp., South Bend; Wm. F. Lange, Casting

*American Foundry Equipment Co., and Secretary-Treasurer, Michiana Chapter.

(Photos courtesy Don Seyferth, West Michigan Steel Fdry. Co.)

A few candid camera scenes taken during the 2nd annual Stag Outing of the West Michigan Chapter, held August 29 near Grand Haven, Michigan. The pictures tell the story that foundrymen know how to play as well as work hard.

Service Corp., La Porte, Ind.; Carl W. Petersen, Dodge Mfg. Corp., Mishawaka; Leonard F. Tucker, City Pattern Works, South Bend.

(Terms expire 1944)—V. C. Bruce, Buckeye Products Co., Elkhart; Herman Hess, Clark Equipment Co., Buchanan, Mich.; W. V. Johnson, Oliver Farm Equipment Co., South Bend, Ind.; Wm. C. Wine, Sibley Machine & Foundry Co., South Bend.

(Terms expire 1943)—J. E. Drain, Oliver Farm Equipment Co., South Bend; A. J. Rumely, La Porte Foundry Co., La Porte; A. T. Ruppe, Bendix Products Div., Bendix Aviation Corp., South Bend; E. R. Westphal, Weil-McLain Co., Michigan City.

NEO Takes Up Training And Casting Design

ROLLING up their shirt sleeves for a new and important season, 100 members and guests of the Northeastern Ohio Chapter met at the Tudor Arms, Cleveland, on September 17 for their first Fall meeting, according to a report by Pat Dwyer, *The Foundry*, Cleveland. Featuring the evening's program were two interesting speakers, Elmer Reynolds of the Apprentice Training Service, Federal Security Agency, Washington, D. C., and E. A. Piper, designing engineer of Pohlman Foundry Co., Buffalo, N. Y.

Mr. Reynolds covered the important subject of apprentice training and methods of training raw and partly skilled men in foundries changing over to war production. Methods employed in several prominent local foundries were described, the work being sponsored jointly by employers, labor unions, and the Cleveland Board of Education, with practical foundry instructors being supplied at government expense.

Mr. Piper's address was designed mainly to assist foundrymen in understanding engineering problems involved in designing castings to meet specifications, and the need for obtaining castings with maximum stress resistance. He stated that many troubles from distortion, cracking and shrinkage can be attributed to faulty design, and stated that conservation of materials and operating efficiency make it imperative for foundrymen to examine the design of castings assigned to them for production.

Minnesota U. Student Chapter Officers

WITH the opening of a new school year, the University of Minnesota Student Chapter of A.F.A. began another successful year, with officers well qualified to lead the chapter's activities. President of the group is Harry R. Dahlberg, one of the winners of the 1942 student essay contest sponsored by the Twin City Chapter. Secretary-Treasurer is Miles B. Olson, who took over when former Secretary Sid Silberg became an ensign in the U. S. Navy recently. The University of Minnesota Chapter is unique in that it is the only student chapter of A.F.A. and cooperates closely both with the Twin City Chapter and the national Association.

Dietert Talks Sand At Cincinnati Meeting

By Henry M. Wood,* Cincinnati, Ohio

BEGINNING a new Fall meeting season with a bang, the largest and most enthusiastic technical meeting in the history of the Cincinnati Chapter was held September 14 at the Cincinnati Club. Retiring Chairman W. M. Ball, Edna Brass Mfg. Co., opened the session and introduced the chapter's new chairman, Frank E. Hutchinson, Reliance Foundry Co., and the other officers and directors. In appreciation for the work of Mr. Ball, a remembrance from the entire chapter was presented to him by Program Chairman E. H. King, Hill & Griffith Co.

Joe Schumacher, Cincinnati Milling Machine Co., as Officer of the Day presented the guest speaker, Harry W. Dietert, Harry W. Dietert Co., Detroit, who offered several reels of motion pictures dealing with "Sand," a subject on which he is a recognized authority. The pictures showed graphically the relationship between casting defects and behavior of sand at elevated temperatures.

One reel of film covered high temperature control of molding and core sands, illustrating what happens in the contact between molten metal and sand. Another reel, on cores, illustrated breakdown tests, and the third reel showed how hot strength of molding sand is measured and controlled. Following each reel a brief period was allowed for questions and discussion. The motion pictures were pronounced unusually interesting as a graphic presentation of a difficult subject.

*W. W. Sly Mfg. Co., and Secretary, Cincinnati Chapter of A.F.A.

Annual Outing Held By Western Michigan

By K. C. McCready,* Sparta, Michigan

WITH an attendance of nearly 300 members and guests, and perfect weather August 29, the 2nd annual stag outing of the Western Michigan Chapter was held without a hitch at Spring Lake Country Club near Grand Haven, Mich. While golf was the main sport of the day, a wide variety of activities was offered, including softball, horseshoe pitching, turtle races, and speed boating on the lake. A number of the facilities were donated by members of the chapter, as were the door prizes. Donors included the Clover Foundry Co., Grand Rapids; Battle Creek Foundry Co., Battle Creek; Grand Haven Brass Foundry, Grand Haven; Muskegon Piston Ring Co., Sparta; and Wolverine Brass Works, Grand Rapids.

Chapter Chairman Cliff J. Lonnes, Muskegon Piston Ring Co., Sparta, Mich., was assisted in the picnic arrangements by A. E. Jacobson, Grand Haven Brass Foundry; Fred Papke, Wolverine Brass Works; Rudy Flora, Clover Foundry Co., Muskegon; Charles Locke, West Michigan Steel Foundry Co.,

*Muskegon Piston Ring Co., and Secretary of the Western Michiana Chapter.

(Photos Courtesy John Bing, A. P. Green Fire Brick Co.)

A perfect summer's day, a fine golf course and good companions formed an ideal combination for the Wisconsin Chapter's annual golf outing, held July 17 at the New Ozaukee Country Club, near Milwaukee headquarters.

Muskegon; Hugh Hislop, Wolverine Pattern & Model Works, Grand Rapids; and Joe L. Brooks, Muskegon Piston Ring Company.

Northern California Commences Big Season

By Geo. L. Kennard,* San Francisco

OPENING a new season of meetings of the Northern California Chapter of A.F.A., it was announced that attendance for the session was the best of any regular meeting ever held by the group. One reason for the excellent attendance was the presence of two fine speakers: Chas. E. Moore, Joshua Hendy Iron Works, Sunnyvale, Calif., and Carl Flesher, regional director, U. S. Maritime Commission.

For his work in production of engines for ships, Mr. Moore has served on a number of Governmental committees, and stressed the need for greater war production in his talk. Mr. Flesher summarized the activities of the Maritime Commission in the Pacific Coast region.

During the evening it was announced that Tom B. McCallum, B. B. Foundry Co., Berkeley, Calif., recently was honored by having a bomber named for him as the result of heavy war bond purchases by his family.

August Meeting

The members of the Northern California Chapter, always eager to obtain more up-to-date data on improving the foundry product, gathered at the Athens Club, San Francisco, on August 19 in response to a special meeting call. Speaker for the occasion, introduced by Program Chairman Serge Kovaleff, Enterprise Engine & Foundry Co., South San Francisco, was Norman J. Dunbeck of the Eastern Clay Products Co.

Subject for the evening was "Synthetic Sands," and the 38 members of 11 Pacific Coast foundries who attended on the last-minute call, gained much from the speaker and from the question period that followed. Chapter Chairman Fred A. Mainzer, Pacific Brass Foundry, San Francisco, presided and introduced the speakers.

*Northern California Foundrymen's Institute, and Secretary-Treasurer of the Northern California Chapter of A.F.A.

Wisconsin Opens Season, Honors Hoyt and Simpson for Services

By Geo. M. Pendergast,* Milwaukee, Wis.

WITH announcement of the most extensive program of activities in its history, the Wisconsin Chapter of A.F.A. began its 1942-43 season September 18, at the Schroeder Hotel, Milwaukee, with an attendance of 267. Newly elected President George K. Dreher, Ampco Metal Inc., Milwaukee, presided at the meeting, during which special tribute was paid to two men who have devoted many years to furthering the interests of the foundry industry.

Twin bronze plaques were presented by the membership to H. S. Simpson, National Engineering Co., Chicago, and past president of A.F.A., and to C. E. Hoyt, for many years Executive Vice-President of the National Association and now A.F.A. Convention and Exhibits Manager. Mr. Hoyt, invited to attend the meeting on the pretext of joining the "Old Timers'" table, found to his surprise that he was really a guest of honor. In acknowledgment, he recalled his early days as a master molder in the Allis-Chalmers shops in 1898, and the 1903 convention in Milwaukee, one of the first national foundry conventions ever held.

Following the dinner session, at which the chapter's new officers, directors and committee chairmen were presented, the meeting broke up into five sectional groups.

Five Divisional Groups

The Pattern Division, organized last spring, held its first session under direction of Walter Schmidt, Falk Corporation, with discussion centering on conservation and problems of the pattern shop. Dr. Jas. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., addressed the Gray Iron Division on meeting specifications in wartime, using slides to present data on dual cupola operation and ladle inoculation. The discussion that followed dealt with sulphur, coke, and removal of foreign material from scrap.

At the Non-Ferrous Division meeting, C. O. Thieme, H. Kramer & Co., Chicago, stressed conservation of critical materials, which inspired many questions. Melting problems featured the Malleable Division, with an

*Geo. M. Pendergast & Co., Inc., and Publicity Chairman, Wisconsin Chapter.

excellent speaker in Dr. H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland. Before the Steel Division, E. R. Young, Climax Molybdenum Corp., Chicago, presented an interesting paper on "Meeting Specifications with Alternate Materials."

Odom Discusses Labor Training at Rockford

WM. ODOM, William Odom Associates, Chicago, appeared as the speaker of the evening at the first meeting of the current season of the Northern Illinois and Southern Wisconsin Chapter. An unusually large attendance was present at the Hotel Faust, Rockford.

With Max Reuteler, Fairbanks Morse & Co., Beloit, the new chapter chairman, presiding, Mr. Odom discussed "Wartime Labor Problems" confronting the foundry industry. Mr. Odom, an experienced consultant, formerly with the National Metal Trades Association, was able to speak authoritatively on many of the special problems now being presented, many related to job classification and foreman training. An interesting discussion period followed the talk, with executives from the foundries of the district participating.

Chairman Reuteler announced appointment of committees to function during the year, and a special announcement was made of the chapter's Christmas party scheduled for December. Visitors and new members were introduced.

Cores and Molds Are New England Topics

By Merton A. Hosmer,* Boston, Mass.

MEMBERS of the New England Foundrymen's Association held their regular first Fall meeting September 9 at the Engineers' Club, Boston, with 90 members and guests in attendance. Raymond Meader, Whitin Mfg. Co., Whitin, Mass., President of the association, presided and introduced the guest speaker, Dr. J. A. Ridderhof, Frederic B. Stevens Inc., Detroit, who presented an interesting paper on the "Use and Action of Core and Mold Coatings."

Dr. Ridderhof outlined the composition of core and mold coatings, heat resistance of graphite, and refractory properties of the high-fusion-point non-carbon minerals. Suggestions were given for preparing and controling coating solutions, and methods of application and drying presented. Specific coatings were suggested by Dr. Ridderhof for special applications, and the speaker stressed the importance of standardization, accurate control, and good housekeeping to obtain best results.

*Hunt-Spiller Mfg. Co., and Reporter, New England Foundrymen's Association.

Some of the newly appointed officers and directors of the Eastern Canada-Newfoundland Chapter of A.F.A. at the initial meeting of the "baby" of the Association held July 19 at Montreal. Left to right (front row)—Harold J. Roast, Canadian Bronze, Ltd., Montreal, and National Director of A.F.A.; Ernest J. Jones, Sorel Industries, Ltd., Sorel, Que.; Robert W. Bartram, Robert W. Bartram, Ltd., Montreal, honorary chairman of the new chapter; Chairman Charles C. Brisbois, The Robert Mitchell Co., Ltd., Montreal; Vice Chairman M. L. Doelman, Electric Steels, Ltd., Cap de la Madeleine, Que.; W. C. Perrot, Canada Iron Foundries, Ltd., Three Rivers, Que.; (back row) R. Bernard, La Cie J. A. Gosselin, Lte., Drummondville, Que.; Emile Drolet, La Cie F. X. Drolet, Lte., Quebec; G. Ewing Tait, Dominion Engineering Works, Ltd., Lachine, Que.; L. Z. Cohen, W. R. Cuthbert & Co., Ltd., Montreal; W. G. Burgess, Jenkins Bros., Ltd., Montreal.; E. N. Delahunt, Warden King, Ltd., Montreal.

Corrections to Chapter Personnel Listings

SINCE publishing in the September issue of *American Foundryman* the Chapter Directory of new chapter officers and directors for 1942-43, attention has been called to the following incorrect listings and omission:

Chicago Chapter—L. L. Henkel, formerly with Interlake Iron Corp., South Chicago, Ill., now is on the staff of the War Production Board, Chicago.

Quad City Chapter—P. T. Bancroft now is representative for Republic Coal & Coke Co., Moline, Ill.

Cincinnati Chapter—Charles R. Hilb, H. Kramer & Co., Cincinnati, is one of the directors of that chapter.

Central Indiana Men Relax At Annual Stag

By Ralph A. Thompson,* Indianapolis

OVER 200 members and guests of the Central Indiana Chapter took a little "time off" from their strenuous wartime activities on September 12 to get together at the Lake Shore Country Club, Indianapolis, for the chapter's annual Stag Outing. Golf naturally proved to be

*Electric Steel Castings Co., and Secretary, Central Indiana Chapter of A.F.A.

the main attraction, with quite a few participants in playing baseball, pitching horseshoes, and putting the shot for prizes. An excellent chicken dinner followed the afternoon's sports.

John Millar, Roots-Connersville Blower Corp., Connersville, Ind., did an excellent job as Master of Ceremonies for the informal evening's program, and A. E. Murphy, Hickman, Williams & Co., Indianapolis, came in for many bouquets for his work as Chairman of the Picnic Committee. Among the guests was R. E. Kennedy, Chicago, National Secretary of A.F.A.

St. Louis Discusses Core Baking Practice

By John H. Williamson,* St. Louis

THE new Chairman of the St. Louis District Chapter of A.F.A., C. B. Shanley, Semi-Steel Casting Co., St. Louis, presided at the first Fall meeting held September 10, at the DeSoto Hotel, St. Louis. However, Past-Chairman Carl H. Morken, Carondelet Foundry Co., opened the session and was presented with a gavel by the chapter in recognition of his services during the past year.

New members and guests were introduced, including a large delegation of visitors from the new Walworth Company plant at Washington Park, Ill. An amendment to the chapter constitution was accepted by the membership, providing for a chapter Chairman, Vice-Chairman and Secretary-Treasurer.

Guest speaker of the evening was L. P. Robinson, Werner G. Smith Co. Div., Archer-Daniels-Midland Co., Cleveland, Ohio, who discussed the "Variables That Affect the Baking of Cores." Mr. Robinson included an interesting comparison of the methods of making and baking cores today and 25 years ago, and considerable discussion of core baking methods followed the paper.

The outstanding advantage of insulating fire brick is its low thermal conductivity.

*M. A. Bell Co., and Secretary-Treasurer, St. Louis District Chapter.

N.F.A. Issues Short Term Training Course

NATIONAL Founders Association, 120 South La Salle St., Chicago, has published a course on "Short Term Training in the Foundry." The primary purpose of the course is to meet the need for more workmen in the foundry industry and to acquaint them with the elementary principles of foundry practice. This course is not intended to supplant the regular four-year apprentice courses and men who complete the course will not be journeymen.

The subjects covered by the course are simple bench molding, simple floor molding, hand operated squeezer machine operation, air-squeezer machine operation, jolt-squeezer molding, jolt turnover machine molding, sand slinger operation, coremaking, cleaning and types of melting furnaces.

At the beginning of the course, a special section is devoted to personal safety in the foundry. The first two lessons deal with sand in the foundry and discuss sands for various type castings; the third lesson discusses many foundry terms and the fourth, gating terms and methods. The remainder of the 21 lessons cover the types of molding and other operations listed above.

Copies of the course may be obtained from the National Founders Association at the previously mentioned address.

J. S. Fowler, Pacific Coast Founder, Dies

WORD has been received of the death, on August 24, of John S. Fowler, secretary and director of the Pacific Foundry Co., San Francisco. Mr. Fowler joined the firm in 1921 and upon the death in 1927 of his father, Edward J. Fowler, who founded the Pacific company in 1887, became metallurgist and supervised the metallurgical department for the past 15 years. Mr. Fowler was an active member of the Northern California Chapter of A.F.A., the Northern California Foundrymen's Institute, the American Society for Metals and other Pacific Coast organizations.

Safety Council Meets in Chicago Oct. 27-29

MEMBERS of industry interested in vital problems of safety will meet in Chicago October 27-29 for the 31st National Safety Congress and Exposition, sponsored by National Safety Council. The war character of this year's program is shown by special sessions on Air Raid Precautions, War Plant Fire Safety, and War Safety Problems and Training.

Of particular interest to foundrymen will be the Metals Section meetings, especially the Foundry Safety session Tuesday. "Safety in War Production" and "Hazards in Use of Substitute Materials" are among the other main topics scheduled.

Book Review

Inspection of Metals, by Harry B. Pulsifer, 6 x 9, cloth cover, 173 pages, 98 illustrations and charts, published by the American Society for Metals, Cleveland, Ohio. Price, $1.50 with cloth cover, $1.00 with paper cover.

The following statement appears on the title page of this book: "This volume has been prepared by the American Society for Metals with the aim and purpose of aiding those engaged in the inspection of metals used in material for the national defense." The author is metallurgical engineer, American Metal Treating Co., and consulting metallurgist, Ferry Cap & Screw Co., Cleveland, Ohio.

The book is divided into 12 sections dealing with the following subjects: Ideals in steelmaking, tests for composition, surface inspection, hardness testing, tensile testing including shear, soundness testing, macrographic patterns, microscopic structures and patterns, grain size testing, coatings and corrosion testing, impact, fatigue and creep testing, and specifications.

As can be seen from the contents, this book is of little value to the foundryman who manufac-

tures gray iron, malleable or nonferrous castings. Its use also is limited in the steel casting industry. However, the sections on hardness, tensile, macrographic and micrographic tests are of limited application. They describe the various tests and in this manner may be of some value.

Book Review

Chemical Analysis for the Foundry Control Laboratory, by H. F. Scobie, 8½x11, paper cover, 41 pages, 20 illustrations, published by the author and available through the Professional College Book Store, University of Minnesota, Minneapolis, Minn. Price, $1.50.

This book is a manual of foundry control chemistry intended primarily for students interested in the analysis of foundry raw materials. In addition it contains helpful information for commercial foundries where a small, versatile control laboratory at minimum expense is desired. The manual has been used for the past six years by students and foundrymen and, more recently, in defense training classes.

The analyses given in this manual cover qualitative tests for the presence of chromium, nickel, molybdenum and copper, and methods of analysis for iron and steel, brass and bronze, coal and coke, and slag.

The first two sections of the manual deal with the technique of the common analytical operations and the degree of accuracy required in the determination of the various constituents of iron and steel. In the section on the analysis of iron and steel, qualitative analytical methods are given for the determination of carbon, silicon, manganese, sulphur, phosphorus, nickel and chromium. In the section on the analysis of brass and bronze, directions are given for the determination of tin, copper, iron and zinc. The section on limestone analysis covers determination for moisture, ignition loss, silica, combined oxides, calcium oxide, magnesium oxide and carbon dioxide.

Directions for the determination of moisture, volatile combustible matter, ash, fixed carbon and sulphur are given in the section on coal and coke analysis while the same information is given for the determination of silica, iron oxide, aluminum oxide, calcium oxide, magnesium oxide and manganese oxide in cupola slags.

Included with the directions for the analytical procedure for each of the substances, are directions for the standardization of solutions and how to make up such solutions. Also appended to the directions for the determination of each substance, is an outline of what happens to the other constituents in the material being analyzed. This latter section is of special interest to those just beginning the study of chemistry. Another point of interest is the fact that the chemical reactions involved in each determination are explained in such a manner that the analyst knows what is happening in the solution on the addition of each reagent.

While this manual was designed for use in foundries, it seems to be of special interest to gray iron foundries.

Book Review

Machine Shop Job Training Units, by the Staff of the William Hood Dunwoody Industrial Training Institute, Minneapolis, Minn., series of seven books, 8½x11, planograph, paper covers, wire binding, published by American Technical Society, Drexel Ave., at 58th St., Chicago, Ill. Price of Job Training Units as follows: Drill Press, Milling Machine, Shaper and Planer, and Grinder, $1.25 each; Lathe and Bench Work, $1.35 each; Instructor's Guide, 75c.

This series consists of job training units for the various generally-used machine tools. The units have been developed and tested for results over a period of many years by the staff of the Metal Trades Department of the institute shown above. Included with each unit is a set of answers for the job check sheets for the various jobs in the book.

These job unit training books are designed for courses organized to develop skills in and impart knowledge and understanding regarding the setup and operation of drill presses, milling machines, planers, shapers, grinders, lathes and for bench work. The latter includes layout work and the care and use of hand and precision tools.

Each lesson in each unit follows a standard outline composed of the following sections: Title of job, general instructions, operating steps, precautions, questions and references. The operating steps are quite detailed and the questions at the end of each lesson are a check on what the student has learned as well as an emphasis on the particularly important points in the lesson. The section on references is designed to supplement the knowledge obtained in practical operation of the various machines. At least one, and sometimes more, sketches accompany each lesson.

The lathe unit contains 141 pages and 43 jobs; bench work unit, 155 pages and 34 jobs; grinder unit, 111 pages and 28 jobs; milling machine, 110 pages and 31 jobs; planer and shaper, 115 pages and 30 jobs, 14 on the shaper and 16 on the planer; drill press, 103 pages and 27 jobs.

Appended to each book are sections dealing with such subjects as hints on blueprint reading for the specific machine tool, shop knowledge items with which the user of the book should familiarize himself, suggested demonstrations by the instructor and references to work on the particular machine covered by the book. Each of the books in this series is a complete course in the operation of a particular machine tool.

Not the least in importance, is the Instructor's Guide which is applicable to all the units in the series. This manual gives directions for teaching job training courses and covers organization and control of the training experience and efficient methods of instruction.

The high reputation of the institution sponsoring these training instructions, lends authority to the series.

Abstracts

NOTE: The following references to articles dealing with the many phases of the foundry industry, have been prepared by the staff of *American Foundryman*, from current technical and trade publications.

When copies of the complete articles are desired, photostat copies may be obtained from the Engineering Societies Library, 29 W. 39th Street, New York, New York.

Air Raid Precautions

See Safety

Aluminum

SECONDARY. *See Non-Ferrous*

Blackout Precautions

(See Safety.)

Boron

ALLOYING. *(See Steel.)*

Brass Scrap

WAR USES. *(See Non-Ferrous.)*

Cast Iron

ALLOYS. *"Economical Alloying of Gray Cast Iron,"* by R. G. McElwee and T. E. Barlow, *Foundry*, vol. 70, No. 6, June 1942, pp. 54-55, 141-146. With today's shortages of materials, proper and judicious use of alloys to the greatest possible advantage is essential. High priority rating of a casting does not justify waste of material through inefficient or careless use. With control over base iron analysis, substantial savings may be made by varying the carbon and silicon balance, keeping silicon content low. Sulphur, manganese and phosphorus should be maintained within proper limits for alloying economy. Control of cupola practice is essential, the most desirable single factor for alloying economy being uniformity. Ladle inoculation is an efficient method of controlling structure uniformity, permits wider use of raw materials and base iron analysis, and is vital to economy in use of alloying elements.

BORON ALLOY. *(See Steel.)*

BRAKE DRUMS. *"Brake Drums—III,"* by Oliver Smalley, *Metals and Alloys*, vol. 15, No. 4, April 1942, pp. 595-598. Results of performance tests are summarized on four brake-drum irons. Composition of the series of drums tested was, in percentages: Total carbon 3.26, Silicon 1.92, Manganese 0.86, Sulphur 0.098, Phosphorus 0.108, Nickel 1.23, Chromium 0.25. Observations on scoring and thermal checking are given. Possibly the most important lesson of the tests is to show that any study of brake drum materials must be made under conditions approaching actual service operations as nearly as possible.

ENAMELING. *"Cause of Defects in Enamel Fired on Cast Iron at Temperatures Above 725°C.—I,"* by C. A. Zapffe, *Journal of the American Ceramic Society*, vol. 25, No. 7, April 1, 1942, pp. 175-180. A previous investigation on enameling cast iron is continued. Various wet-process enamels were fired at temperatures above 725° C. (1335° F.). Blistering and pinholing, even at high temperatures, were found to be caused principally by hydrogen contained in the iron and not by carbon oxides. If carbon oxides form, they do not occur in sufficient quantities to deface the enamels. Dehydrogenized cast iron may be fired as high as 790° C. (1455° F.) with a direct application of sheet-steel white cover coat and at 840° C. (1545° F.) with sheet-steel ground coat without incurring defacement. The moisture content of certain constituents in wet-process enamels at higher temperatures causes an important gas effusion by reacting with the metal. The characteristics of the behavior of hydrogen in cast iron during enameling are compared with those of hydrogen in steel.

HIGH STRENGTH. *"The Substituting of High-Duty Gray Iron for Steel Castings,"* by J. Blakiston, *Foundry Trade Journal*, vol. 67, No. 1351, July 9, 1942, pp. 241-246, 251; vol. 67, No. 1352, pp. 263-269. Specific examples of high-duty gray iron displacing steel are given, such as boring bars, boring lathe heads, spindles, crankshafts, boring and planing machine racks, flame-hardened machine gears, extrusion press body, and pump bodies, crossheads and connecting rods. In order to convince engineers as to the potentialities of the newer irons, highly practical tests are detailed instead of the usual tensile tests, the tests described being especially adaptable to small foundries having no expensive testing equipment. Production considerations are described, including cupola operation, furnace details, composition of irons, melting losses and inoculation, and the importance of design.

MACHINE TOOL CASTINGS. *"Turret Lathe Castings Must Be Perfect,"* by Pat Dwyer, *Foundry*, vol. 70, No. 1, January, 1942, pp. 58-61, 148-150. Development of a high-strength cast iron for turret lathe castings is described, the iron mixture containing 70 to 90 per cent steel with resulting low carbon and high silicon, instead of the conventional semi-steel mixture of high carbon-low silicon type for cast beds, frames and sliding members. Carbon is controlled at lower limits 2.70-2.85 per cent, resulting in good machinability, high hardness, excellent machine finish and higher rigidity, with less warpage without ageing. An occasional scoring or galling of wearing surfaces or ways was solved through long experimental work, which led to the conclusion that presence of primary ferrite was responsible. By reducing silicon in the base mixture 25 to 50 points and replacing it through ferrosilicon additions at the spout, the primary ferrite was almost wholly eliminated. All patterns are mounted on boards and include patterns for gates, a point considered essential with green help constantly being broken in. Metal is melted in two cupolas side by side, lined to 48 and 54 inches I.D., respectively, and both cupolas are served by the same charging platform.

WELDING. *"Gas Welding of Cast Iron,"* *Iron Age*, vol. 150, No. 6, August 6, 1942, pp. 58-62. Fusion welding of cast iron, using cast iron instead of bronze rod, is particularly interesting today because of the scarcity of the non-ferrous rod. The fusion process is more satisfactory from the color standpoint as well as in resistance to high temperatures such as those encountered in welding damaged stove parts. Because successful gas welding demands the ability to identify the type of cast iron, the white, gray and chilled gray irons can be successfully fusion welded, whereas the heat treatment used in producing malleable iron precludes this welding process. The author discusses welding characteristics of various irons, control of molten metal, quality precautions, welding of heavier castings, and preheating devices. Because few operators have any experience in fusion welding cast iron, it will be necessary to train them in the general principles and to point out the difficulties that may be encountered, some of the difficulties involved being covered in the article.

Cupola

(See Cast Iron.)

Machine Tool

CASTINGS. *(See Cast Iron.)*

Magnesium

ALLOY DESIGNING. *See Non-Ferrous*

Magnesium Bombs

FIRE CONTROL. *See Safety*

Correction

IN THE Abstracts of Current Foundry Literature in the September Issue of American Foundryman, an article on an "Investigation of the Influence of Mold Friction on Tearing in Castings" was attributed to to Foundry Trade Journal alone, in error. We now learn that the paper had previously been published by the Iron and Steel Institute, London.

Management

WAGE INCENTIVE. *"Incentive for Production,"* by J. M. Dugan and G. D. Griffiths, *Iron Age,* vol. 150, No. 8, August 20, 1942, pp. 56-60. Of vital interest to the management of all plants concerned with machining of rolls, now that maximum production is so necessary and the supply of skilled labor so restricted, is an incentive system for roll machining. The wage system described, based on more than a year of study, is one in effect at the Ohio Steel Foundry Co., Lima, Ohio, for roll turning and machine operations. It has proved satisfactory from the standpoint of management and workers alike, and many incidental operating difficulties have been overcome through its use, as well as standardizing of machining work being arrived at.

Non-Ferrous

BRASS SCRAP. *"Upgrading of Scrap Brass to War Uses," Metal Progress,* vol. 42, No. 1, July 1942, pp. 66-69. Digest of report to the Office of Production Management by the Advisory committee, National Academy of Sciences, on reclamation of secondary copper. The shortage of good copper scrap today is caused by a drying up of normal sources, and an increase in demand for essential production. Typical large remelters normally ship at least one-fourth of their alloy ingot to plumbing goods manufacturers, who also buy scrap freely for compounding in their own foundries, only one-tenth of this product having any priority rating. Consequently it is believed that a quantity of "orphan" brass (high zinc alloy) is to be anticipated. It is recommended that a study be made of the reclamation problem, toward separation of the metals to a purity consistent with excellent recoveries of the four valuable metals, copper, zinc, tin and lead. Methods are available, but plant capacity may be lacking.

BRASSES AND BRONZES. *"The Founding of Types A and B Brasses," The Metal Industry* (London), vol. 61, No. 3, July 17, 1942, pp. 34-36. Molding and pouring technique, determination of aluminum, chemical and physical properties, and results obtained from scrap metal charges in melting Types A and B brasses under war emergency specifications of the British Standards Institution, are given.

FOUNDRY PLANNING. *"Planning the Non-Ferrous Foundry,"* by N. K. B. Patch, *Foundry,* vol. 70, No. 1, pp. 67, 145-147. Second of two articles, first appearing in *Foundry,* vol. 69, No. 12, December, 1941, pp. 64, 152-154. The foundry floor is important in planning, from standpoints of serviceability, long life and safety. Best floor is thoroughly dry. Where extra heavy castings are to be made in pits, drainage of the plant is essential. Furnace floor must be little affected by temperature. Aisles get hardest use and long life is essential. Artificial ventilation, with heating provisions, must be adequate. Molders should not be spaced closer than 7-foot centers, farther apart if individual sand heaps used. Furnaces should be centrally located and conveyor for delivering molten metal should be fast, safe and least damaged by dust and service. Location of departments with respect to each other is important. For close analytical control, the laboratory must be conveniently located, not stuck off in some out-of-the way corner, with good light, ventilation and equipment.

LOW TIN BRONZES. *"Low-Tin and Tin-Free Bronzes and Brasses," Foundry Trade Journal,* vol. 67, No. 1349, June 25, 1942, pp. 205-208; vol. 67, No. 1350, July 2, 1942, pp. 221-230; vol. 67, No. 1351, July 9, 1942, pp. 247-251. Also *The Metal Industry,* vol. 60, No. 26, June 26, 1942, pp. 429-431; vol. 61, No. 1, July 3, 1942, pp. 2-6; vol. 61, No. 2, July 10, 1942, pp. 18-20. To conserve tin through substitutes for Admiralty gun metal and similar bronzes, the British Standards Institution has drawn up War Emergency Specifications for two additional gun metals, two grades of cast brass, a silicon-bronze, and an aluminum-bronze. This paper covers the report of the Non-Ferrous Sub-Committee of the Technical Committee, Institute of British Foundrymen, on foundry practice in using these substitutes. Part I covers the silicon-bronzes as casting alloys, including specifications, casting properties, physical properties, scrap, welding and alloys. Part II compares the properties of low-tin gun metals and brasses, in physical properties, corrosion, production, and applications. Part III compares properties and production data of low-tin content gun metals and cast brasses with 88-10-2 gun metal.

MAGNESIUM ALLOY DESIGN. *"Designing with Magnesium Alloys," The Metal Industry* (London), vol. 60, No. 20, p. 337. Digest of paper by Max Schonberg, translated in *Engineer's Digest.* With the light alloys, emphasis on engineering design is shifted to modulus of elasticity instead of strength as a primary factor. Consideration must be given to actual working temperatures, wear and abrasion resistance, friction and surface characteristics, corrosion resistance and local over-stressing. Methods of designing magnesium alloy castings with these considerations in mind are given briefly as a general guide.

SECONDARY ALUMINUM. *"The Utilization of Secondary Light Metals,"* by H. G. Warrington, *The Metal Industry* (London), vol. 60, No. 20, pp. 332-333. The main sources of material that provide the bulk of recovered high-strength alloys in Britain are process scrap, such as sheet cuttings, extrusion discards and end pieces, tube ends, inspection samples, rejected stampings and machining scrap classed as swarf, bar ends and rejections. Wartime control in England has successfully introduced segregation of secondary metal so that material returned to remelters is largely in a sorted condition and may be used with great assurance that the resulting alloy will be usable. Recommended procedure for utilizing a consignment of swarf is detailed, including remelting and purification of alloys. The general considerations of scrap disposal are an important factor to the light alloy industry when it is realized that by suitable précautions material can be converted almost to its original market value.

SILICON BRONZE. *"Sand Casting of Silicon Bronzes and P.M.G. Metal,"* by W. Machin, *Foundry Trade Journal,* vol. 67, No. 1345, May 28, 1942, pp. 111-116; vol. 67, No. 1346, June 4, 1942, pp. 133-137; vol. 67, No. 1347, June 11, 1942, pp. 155-159; vol. 67, No. 1348, June 18, 1942, pp. 179-184. Some of the causes of defects in brass and bronze castings are given from the practical standpoint, including molding faults, moisture, scabbing, running conditions, vents, dressed scabs, defective core vents, oxide inclusions, oxidation. The manufacture and properties of P.M.G. metal are discussed, including P.M.G. hardener, melting procedure, castings, running problems, etc. It may be assumed that the greater portion of defective castings are caused by workmen overlooking some small but important detail of practice. Composition, temperature and treatment of the metal are of greatest importance in producing sound castings. Contraction problems are discussed, and a short freezing range considered undesirable. The author warns strongly against mixing P.M.G. scrap with other non-ferrous scrap, and gives data on melting losses of P.M.G. metals under repeated remelting, also tensile properties of remelted metal.

TIN ALTERNATIVES IN BRONZE. *"Alternatives to Tin in Cast Bronzes,"* by A. E. Cartwright, *The Metal Industry* (London), vol. 61, No. 9, August 28, 1942, pp. 133-135. It is believed that qualities available in some tin-free bronzes are, for the most part, superior to those of tin bronzes. Three tin-free bronzes are considered: Manganese bronzes, Aluminum bronzes, and Silicon bronze. All three types are said to be superior in strength to gun metal, phosphor bronze, or any other so-called tin-bronze. Manganese bronzes are available in a great range of physical properties. Aluminum bronzes are particularly reliable in strength, fatigue resistance, high-temperature and super-heated steam service, and wear and corrosion resistance. More detailed data are given on some cast silicon bronzes and on existing specifications. The use of nickel as a partial substitute for tin also is considered.

Planning the Foundry

NON-FERROUS. *(See Non-Ferrous.)*

P.M.G. Metal

(See Non-Ferrous.)

Safety

BLACKOUT PRECAUTIONS. *"Safety in a Blackout," Safety Engineering,* vol. 83, No. 1, January 1942, p. 17. A new type of blackout in which camouflage, lights and fluorescent chemicals will all play an important part, is described. Long wave ultra-violet light and fluorescent and phosphorescent chemicals will be used. Hydrants, sidewalks, curbs, bomb shelters, motor cars and clothing can be marked with chemical paints, visible only when irradiated by invisible ultraviolet rays. By use of camouflage lights, engineers can build decoy airfields, bridges and other faked military objectives in deserted areas. Such a blackout would be controlled from power stations, and by police and civilian patrols, protecting against "hit and run" air raids.

MAGNESIUM FIRE CONTROL. *"Extinguishing Industrial Magnesium Fires and Incendiary Bombs,"* by H. R. Brown and H. P. Greenwald, *Industrial Heating,* vol. 9, No. 9, September, 1942, pp. 1154, 1156, 1158, 1160. Increased use of magnesium in war production plants involves a serious fire hazard the same as magnesium incendiary bombs. Three methods for combating such fires are described as (1) hastening combustion with water, (2) partially sealing the fire with incombustible materials, and (3) completely sealing the fire with materials that soften and flow. Each of the methods are discussed. Materials forming an effective fire covering, those forming a partly effective

covering, and ineffective materials are described. Details are given of pitches derived from coal tar as developed by the U. S. Bureau of Mines for complete sealing of magnesium fires. To be usable the pitch must be of the type called "very hard" with a softening point not much less than 300° F.

Silicon Bronze

(See Non-Ferrous.)

Steel

BORON ALLOY. *"Boron—A New Vitamin for Steel and Cast Iron,"* by N. F. Tisdale, *Metal Progress,* vol. 41, No. 3, March 1942, pp. 330-331. In conserving strategic alloying elements, boron was studied as a substitute in casting iron and steel, under a research fellowship established by Molybdenum Corp. of America at the University of Pittsburgh. As much as 0.03 per cent boron causes hot shortness, attributed to formation of an envelope of insoluble material around the grain boundaries. Less than 0.003 per cent boron is generally recommended and is used beneficially by several steel companies, apparently increasing tensile strength without changing reduction of area or percentage elongation. To conserve chromium, manganese-molybdenum-boron steels have been developed. In cast irons, 0.02 to 0.10 boron is used effectively, acting as an agent for control of depth of chill in iron rolls, and increasing surface hardness. Because very small amounts produced marked changes in physical properties, accurate control is essential. Research on boron in plain carbon and alloy steels and irons is still going on.

ELECTRIC MELTING. *"Equilibria of Liquid Iron and Simple Basic and Acid Slags in a Rotating Induction Furnace,"* by C. R. Taylor and John Chipman, *Metals Technology,* A.I.M.M.E., vol. 9, No. 6, September, 1942, Tech. Pubn. 1499, pp. 1-18. The study of chemical reactions of liquid steel and basic open-hearth slag involves a complex slag system of at least eight important components. Results of an experiment in a rotating induction furnace are presented, of the equilibrium between liquid iron and slags of the system (CaO-MgO)—SiO_2—FeO at the temperatures encountered in steelmaking practice. Solubility of iron oxide in liquid iron under pure iron oxide slags was redetermined. Equilibrium oxygen content of the metal at 1600° C. is taken as a measure of the activity of iron oxide in the slag. The variation of the activity of iron oxide in slag is explained. Indications are that no compound is formed between silica and ferrous oxide at 1600° C. The effect of magnesia was qualitatively found to be almost the same as lime in concentrations up to 10 per cent. The solubility of nitrogen in pure iron was checked at 0.04 per cent.

INCLUSIONS. *"Silicon-Oxygen Equilibria in Liquid Iron,"* by C. A. Zapffe and C. E. Sims, *Metals Technology* of A.I.M.M.E., vol. 9, No. 6, September 1942, Tech. Pubn. 1498, pp. 1-30. An investigation of the behavior of inclusions in steel several years ago led to the conclusion that some of the commonly occurring inclusions have appreciable solubilities, particularly in liquid steel. To clarify the subject, a laboratory study of oxides in liquid steel was started. These oxides are generally the result of deoxidation treatment, and the basis of an understanding of their behavior must therefore be the behavior of the deoxidizer in liquid iron. The Fe-Si-O system was selected for the first study, and apparatus used and tests conducted are described. The author concludes that results obtained lead to an unusual interpretation of many steelmaking phenomena, and that present concepts of oxygen and oxide in steel lead to a re-evaluation of the importance of pure chemical processes in forming inclusions.

LIQUID TEMPERATURE. *"Temperature of Liquid Steel," Iron and Steel,* vol. 15, No. 10, May 14, 1942, pp. 332-338. Third report of the Liquid Steel Temperature Sub-Committee of the Committee on Heterogeneity of Steel Ingots, Britsh Iron and Steel Institute, dealing with the quick-immersion technique of measuring liquid steel. The report contains general comments on the design of the quick-immersion thermocouple on temperature distribution and control in the furnace and in the ladle, and on emissivity and optical pyrometry; an outline of the sub-committee's program of research; and an account of recent experimental work carried out with the quick-immersion thermocouple in several English steelworks. Characteristics of the instrument are given and its application discussed for large open-hearth and electric furnaces, for small electric and high-frequency furnaces, and for ladle and trough work. Possibilities of control are presented in terms of actual experience of several English steelworks.

Testing

STEEL TEMPERATURE. *(See Steel.)*

Tin Conservation

ALTERNATIVES. *(See Non-Ferrous.)*

Welding

CAST IRON. *(See Cast Iron.)*

October Chapter Meeting Schedule

October 2
Western New York
Hotel Touraine, Buffalo
FRED G. SEFING,
International Nickel Co.
"Some Phases of Today's Problems of Melting Gray Iron"

✦ ✦

October 5
Central Indiana
Washington Hotel, Indianapolis
PAT DWYER, *The Foundry.*
"Gates and All That There Kind of Stuff"

✦ ✦

October 5
Chicago
Chicago Bar Association Restaurant
J. L. GRAHAM
Pullman-Standard Car Mfg. Co.
"Inspection of and Specifications for War Materials"

✦ ✦

October 6
Michiana
Hotel La Salle, South Bend

✦ ✦

October 8
St. Louis District
Hotel De Soto, St. Louis
C. H. MORKEN,
Carondelet Foundry Co.
"Cooling Reactions of Cast Iron"

October 8
Northeastern Ohio
Cleveland Club

✦ ✦

October 9
Central New York
Onondaga Hotel, Syracuse
R. C. GOOD,
Electro Metallurgical Co.
"The Treatment of Cast Iron with Ladle Additions"

✦ ✦

October 9
Philadelphia
Engineers Club
EMILE PRAGOFF, *Hercules Powder Co.*
"Cores"

✦ ✦

October 9
Toledo
Group Program
"Sand Molding and Core Making for Gray Iron"

✦ ✦

October 10
Western Michigan
Ferry Hotel, Grand Haven
H. W. DIETERT
Harry W. Dietert Co.
"Value of High Temperature Sand Control of All Foundry Sands"

October 12
Cincinnati
M. J. GREGORY, Caterpillar Tractor Co.
"Core Blowing in a Jobbing Foundry"

✦ ✦

October 16
Birmingham
Tutwiler Hotel, Birmingham
Procurement of Necessary Materials for Foundries

✦ ✦

October 22
Southern California
Clark Hotel, Los Angeles

✦ ✦

October 23
Chesapeake
Engineers Club, Baltimore, Md.

✦ ✦

November 2
Chicago
Chicago Bar Assn. Restaurant
ROUND TABLE DISCUSSIONS
Steel Div.—*Melting Steel by the Triplex Method.*
Gray Iron Div.—*Casting Defects.*
Malleable Div.—*Effects of Scarcity of Preferred Melting Stock.*
Non-Ferrous Div.—*Silicon Bronzes.*
Pattern Div.—*Discussion of A. F. A. Apprentice Contest Patterns.*

Take It From the Marines---
You Have to KNOW to WIN!

In the last world war U. S. Marines trained at Parris Island, South Carolina, to the powerful slogan: "If you don't know, you get killed!" In this war the slogan for war production industry might well be: *"If you don't know, we lose!"*

Progressive foundries are making every effort to increase the skills of their present employees, and to train the new men and women being employed, by keeping them better informed about their jobs. Many plants are building up and maintaining up-to-date technical libraries so that their employees may "Improve Through Learning." These libraries invariably include the A.F.A. Bound Volumes of *"Transactions."*

These Bound Volumes contain a vast amount of valuable, authoritative data on foundry practices and processes. They include papers and discussions on every branch of the castings industry—Steel, Malleable, Non-Ferrous, Gray Iron—prepared by recognized authorities on foundry research and practice. These men know that *better informed employees* and *better production* go hand in hand.

Start your personal library or a plant library—or build up your present fund of information —with these Bound Volumes. We have to KNOW to WIN!

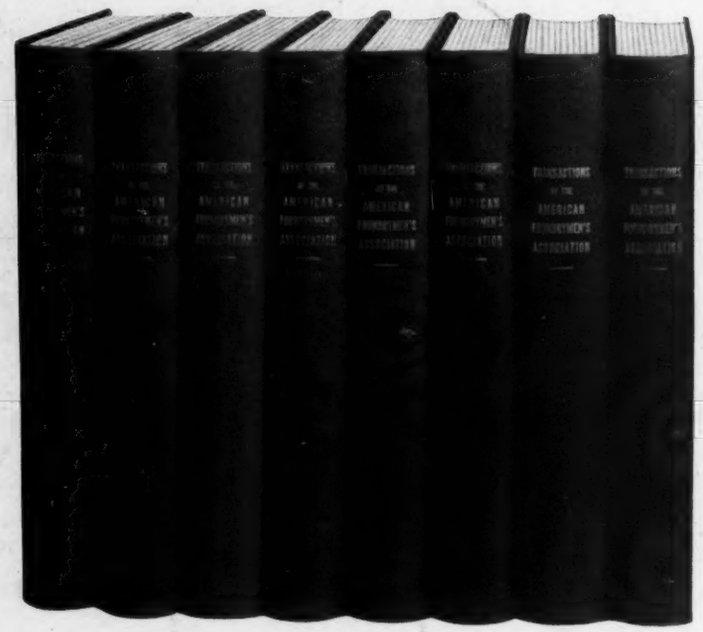
VOLUMES AVAILABLE

No. 49—1,039 pages
No. 48— 815 pages
No. 47—1,030 pages
No. 46— 950 pages

PRICE

$3.00 Each to A.F.A. Members

$15.00 Each to Non-Members



Add These VALUABLE BOOKS To Your Technical Library!

MAIL COUPON TODAY

AMERICAN FOUNDRYMEN'S ASSOCIATION Dept. OC-1
222 West Adams St., Chicago, Ill.

Gentlemen:

Please send me A.F.A. Bound Volumes of "Transactions" checked below.

☐ **Vol. 46** ☐ **Vol. 47** ☐ **Vol. 48** ☐ **Vol. 49**

($3.00 each to A.F.A. Members, $15.00 each to Non-Members)

Name .....

Company .....

Address ..... **City** ..... **State** .....

I enclose ☐ **Check** ☐ **Money Order** ☐ **Cash for $**..... **to cover cost.**